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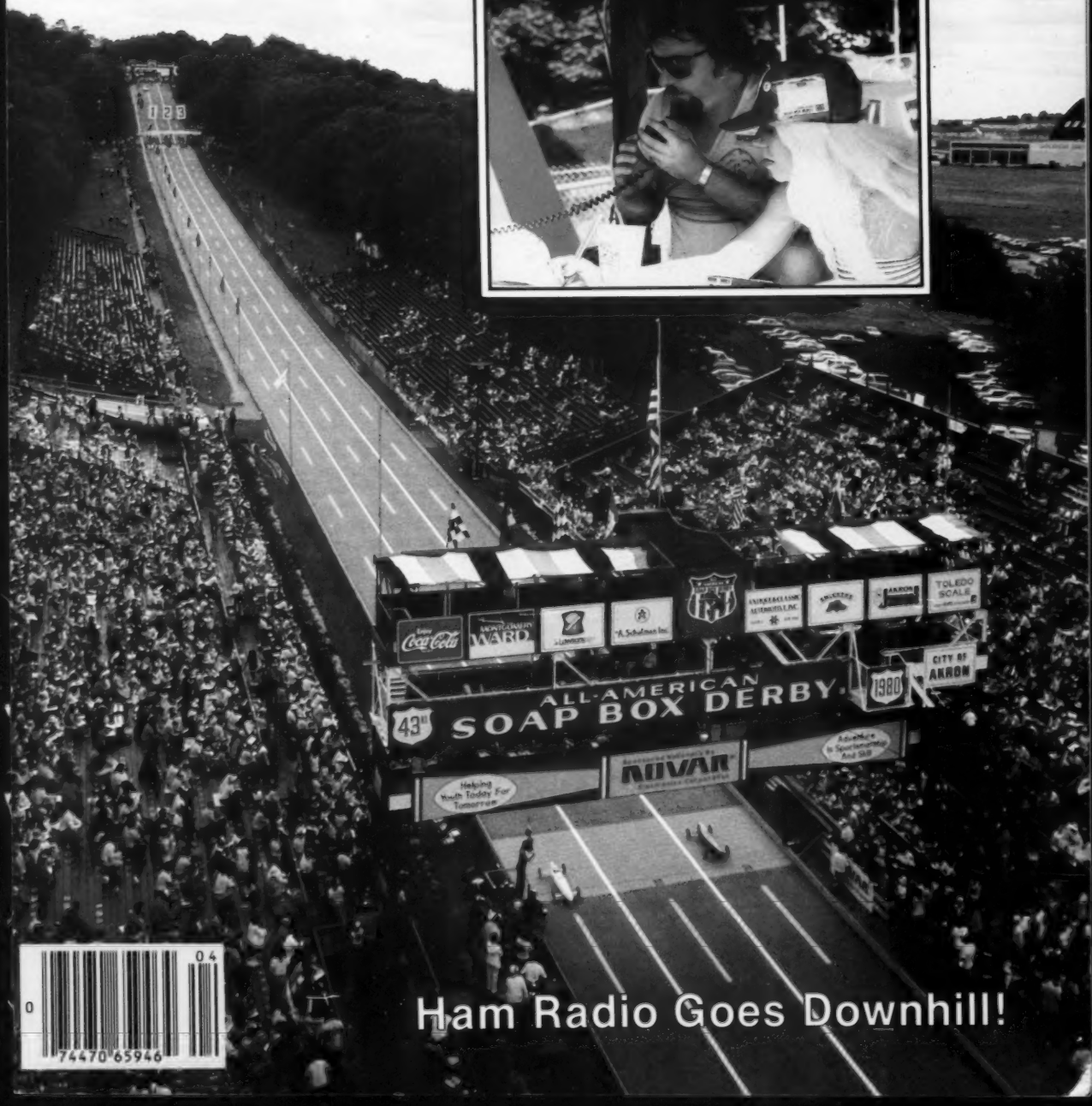
73 MAGAZINE
FOR RADIO AMATEURS



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S-30...$89.00* S-80...$149.00*

*For use with S-1 and S-5

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S-20...$89.00

Specifications:
Frequency Coverage: 440 to 449.995 MHz
Channel Spacing: 25 KHz minimum
Power Requirements: 9.8 VDC
Current Drain: 17 ma-standby 400 ma-transmit (1 amp high power)
Antenna Impedance: 50 ohms
Sensitivity: Better than .5 microvolts nominal for 20 db
Supplied Accessories: Rubber flex antenna 450 ma ni-cad battery pack, charger and earphone
RF output Power: Nominal 3 watts high or 1 watt low power
Repeater Offset: ±5 MHz

Optional Accessories for all models

12 button touch tone pad (not installed): $39 • 16 button touch tone pad (not installed): $48 • Tone burst generator: $29.95 • CTCSS sub-audible tone control: $29.95 • Leather holster: $20 • Cigarette lighter plug mobile charging unit: $6

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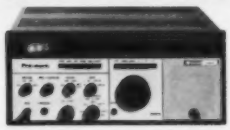

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REG. 279.95 $249.95

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$145.00

This 160-190 KHz transmitter kit is easy to build. The power supply and exciter portions are factory wired and tested, the Litz wire coils are wound and complete instructions are supplied so you can build it in one evening. The main unit with control panel (shown above) installs at your operating position. The active antenna matching network mounts at the base of your vertical antenna. A 50' antenna is permitted. Shorter antennas can be used. Transmitter operates from 115-v AC. One watt input crystal controlled (crystal supplied). No license needed. Meets all FCC requirements. Not for use in Canada.

Enter the fascinating world of low frequency radio. Order your transmitter today! Free brochure on request.

Complete your 1750 meter station with:

VLF CONVERTER
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Converts the band 10-500 KHz to 3510-4000 KHz so you can hear it on your short wave receiver. Stable crystal control. Sensitive IC mixer and RF stage. Covers the 1750 meter band, navigation radiobeacons, ship-to-shore, European low frequency broadcast band. Free brochure on request.

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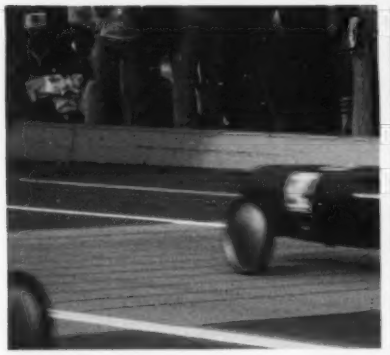

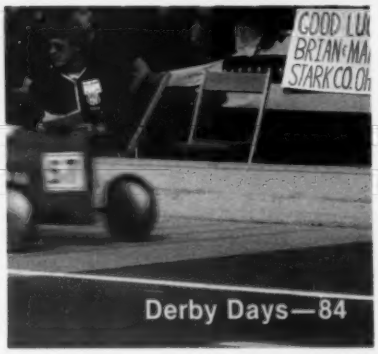

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Cover: Photo by Henry Ruminski WD8JOI, Cuyahoga Falls OH.

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

DOING SOMETHING ABOUT IT

There is one basic reason why the ham market has been soft during the last year and it has little to do with the job market, stagflation, or the recession. The main reason why hams have not been buying very much ham gear lately is that there have been far fewer new hams... and this means fewer enthusiastic newcomers looking for fun.

If amateur radio was growing at the rate of 11% as it did before the proposal of "Incentive Licensing," we would be welcoming about 75,000 new Novices a year. That would represent the 11% growth plus those needed to make up for the dropouts and silent keys. That represents a buying market of over $100M. Even when you spread that amount around among about 200 ham stores, that represents another half million dollars in sales for each store.

Tufts Electronics has moved things around in their store and set up a classroom for teaching the Novice course. It has been so successful that they are now planning for General and Advanced courses as well. They have been charging $35 for the course, which runs for ten weeks, one night a week. Judging from the interest shown in the courses, Tufts is now estimating that they will be able to license about 50 new hams a month.

The money for the courses goes for some of the instruction materials, some for the instructor, and the rest for advertising and overhead. Clubs running Novice courses have found that the more a student has invested in a course, the more likely he is to complete it. That makes sense, when you think about it, but the anti-profit nuisance who turns up now and then wanting the classes to be free louses it up for everyone.

Perhaps you can talk this over with your local ham supplier and get him to set up Novice courses. Remind him that each Novice historically buys about $1,500 in ham gear and books, so it is well worth his while to see that we have as many newcomers as possible. We should also do all we can to get our clubs to have Novice classes and try to empty out the high schools for prospects. Remember that about 80% of these teenage Novices will decide to make electronics their career ...and they just might be the answer to the loss of technology to Japan.

One more reminder: The *73* series of code tapes is the world's fastest way to learn the code...and the *73* theory course is the best one on the market because it stresses learning the theory rather than memorizing questions and answers. These are ideal teaching adjuncts to any Novice class.

RADAR CRUISE CONTROL

One of the benefits of the recent interest in police radar and its detection has been a good deal of research on the use of radar for cars. RCA, in particular, has been working on the problems and has come up with a system which would enable a car to automatically follow the car ahead, keeping pace with it. This is a small radar unit which is connected to the cruise control of a car, either allowing the following of the car ahead or else maintaining speed until a car is detected ahead, at which time the radar would disable the cruise control automatically.

Speaking of radar, the car magazines all seem to be of the opinion that Reagan will be backing an end to the 55-mph speed limit, putting the responsibility for speed control back on the states. Many of the western states are not at all enthusiastic about the limit.

There seems to be convincing proof that our government agencies have been covering up the facts about the speed limit and have been supplying us with highly distorted reports on the supposed benefits. Rather than either saving lives or oil, the speed limit may have both increased traffic fatalities and saved hardly any oil. The major benefit has been to the makers and dealers selling radar units to the police...and detectors to the public. Cozy arrangement.

The other major benefactors of the speed limit have been the CB industry and the communities which have gotten the take from the speeding tickets...billions of dollars.

Some psychologists have pointed out that one of the results of making virtually everyone a criminal is to alienate the public from the police and thus encourage crime...and reduce the cooperation needed.

Perhaps the bright spot of all this will be the developments we can see coming as a result of the radar research.

SAROC

Having been unable to locate anyone who attended, I'm going by reports from third parties: UGH.

Not only were there fewer than 1,000 in attendance, what few there were apparently were

TECH WIZARDS

We seem to be getting more and more technical questions whose answers require more and more of our time which we seem to have less and less of. We would like to revive the Technical Aid Group concept which appeared here 10 years ago.

Please, you wizards out there who *want* to help (without compensation), send us your qualifications (experience, degrees, area of expertise, if any, etc.) and complete address. Then when readers have questions they can talk to an expert.

Don't take this lightly—some questions are difficult and will require some digging. But if you can help, you might save someone a lot of grief.

Write to Editorial Offices, *73 Magazine*, Pine Street, Peterborough NH 03458, attention: Tech Wizards.

TRAVELING HAMS

We believe that there are many interesting stories related to ham radio across this wide world that are begging to be told. When you do travel, keep that in mind. You may be the only outsider who is a ham to visit a hidden valley somewhere. Neither *73* nor any other amateur radio publication has the staff to do this adequately; we are depending on you.

When you have a trip coming up, let us know. We may have heard about something along your route that may be of interest to us all. You might even make a few dollars to put toward your next trip. So, put a note pad and pencil in your camera case and start thinking like a roving reporter.

If you are interested, send your travel plans to Editorial Offices, *73 Magazine*, Pine Street, Peterborough NH 03458, attention: Traveling Hams.

Hand-shack.

TR-2400

Put a little shack in your hand. The TR-2400 is the latest hand-held for 2 meters FM. It features a large LCD readout that can be read in direct sunlight or in the dark, 5-kHz-step PLL synthesized operation, 10-channel memory, scanning, and 16-button autopatch DTMF encoder.

TR-2400 FEATURES:

- **Large LCD digital readout**
  Readable in direct sunlight (better than LEDs). Readable in the dark (with lamp switch). Virtually no current drain (much less than LEDs) and display stays on. Rugged and dependable in hot or cold temperature ranges. Shows receive and transmit frequencies and memory channel.
- **5-kHz-step frequency selection**
  PLL synthesized keyboard channel selection system. No "5 up" switch needed. Selects from 144.000 to 147.995 MHz.

CONVENIENT TOP CONTROLS

- **UP/DOWN manual scan**
  Single or fast continuous 5-kHz steps from 143.900 to 148.495 MHz for Amateur and MARS or CAP simplex or repeater operation.
- **10 memories**
  Retained with battery backup (only 2.0 mA). "M0" memory may be used to shift the transmit frequency any desired amount to operate on repeaters with nonstandard split frequencies.
- **Built-in autopatch DTMF encoder**
  All 16 buttons of keyboard provide telephone dual-tones while transmitting.
- **Automatic memory scan**
  Checks all 10 memory channels. Programmable to lock automatically on either BUSY (signal present) or OPEN (no signal) channels.
- **Repeater or simplex operation**
  Convenient mode switch shifts transmit frequency +600 kHz or -600 kHz or to the frequency stored in "M0" memory.

- Two lock switches
  Prevent accidental frequency change and accidental transmission.
- Microphone PTT and audio terminals
- Charger terminal
- Earphone jack
- **Reverse operation**
  Push-button switch shifts receiver to transmit frequency and transmitter to receive frequency.
- **BNC antenna connector**
  Easy to connect external antenna.
- **LCD "arrow" indicators**
  Show "ON AIR" "MR" (memory recall), "BATT" (battery status), and "LAMP" switch on.
- **High-impact case and zinc die-cast frame**
  Extremely rugged with antenna counterpoise.
- **External PTT microphone and earphone connectors**
  Easily accessible on right side of transceiver.
- **Compact and lightweight**
  Only 2-13/16 inches wide, 7-9/16 inches high, and 1-7/8 inches deep. Weighs only 1.62 pounds (including antenna, battery, and hand strap).

Standard accessories included:

- Flexible rubberized antenna with BNC connector
- Heavy-duty (450-mAh) NiCd battery pack
- External-standby (PTT) plug
- External-microphone plug
- AC charger • Hand strap
- Earphone

More information on the TR-2400 is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

KENWOOD
...pacesetter in amateur radio

Optional accessories:

- ST-1 base stand (shown) which provides 1.5-hour quick (90%) charge, 4-pin connector for dynamic microphone, and SO-239 antenna connector.
- BC-5 DC quick (90%) charger (1.5 to 2.0 hours)
- SMC-24 speaker/microphone
- LH-1 deluxe leather case (top-grain cowhide)
- PB-24 extra battery pack with charger adapter
- BH-1 belt hook

Specifications and prices are subject to change without notice or obligation.

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siphoned off by a competing event put on by the local ham club, which has not been silent in its bitter feelings about the SAROC hamfest . . . an event put on mostly by one chap for profit . . . and supported almost solely by *Ham Radio* magazine.

The show did get a great review in *HR*'s Half Right Reports, thus preserving their record for objectivity. Will there be another debacle next year? It seems unlikely.

VEGAS

Though I didn't go to the SAROC mess this year, I did have to get out to Vegas for the Winter Consumer Electronics Show (CES) a couple of days later. The weather was perfect and the town was crowded with about 60,000 attending the CES. With the casinos vying with each other to provide low-cost eats, you can do very well in the town on about $6 per day. Even the local people come to the strip to get in on the $1.49 breakfast buffets.

Other than that, most of the things in Vegas are so tacky that I really dislike the place. The casinos are packed most of the day and night with people pulling the levers of the slots. Are they having fun? I watched several hundred of them and I saw not one smile. Even when the jackpot would eventually dump on them they accepted it stoically and went back to seeing how fast they could get the coins back into the machine.

At the airport, while I was waiting for my plane, I watched a shabbily-dressed couple get $100 in dollars and start feeding them into a slot machine. By the time I'd finished my ice cream, the $100 was gone. I never saw one sign that either of them was enjoying the experience. They just stood there silently, as though hypnotized, sliding in the dollars, three at a time.

It is not really difficult to win in Vegas . . . at least until they get to know you . . . but you have to know what you are doing and spend some time learning how. I've written about this in one of my other magazines in more detail. Obviously, before you tackle the professionals, you want to have your system not only perfected, but very well practiced. This is where the computer comes in . . . affording you practice without having to pay for it. It is far better to learn for free and take your lumps than to try to get your gambling education at $2 a throw.

Quite a number of people have come up to me at shows and tried to argue that you can't really win at gambling in Vegas. When I pry into their knowledge of the subject, I find that they know virtually nothing about it.

Continued on page 120

Well . . . I Can Dream, Can't I? **by Bandel Linn K4PP**

"Your ½-Watt QRP rig is putting in a bone-crushing signal here in central India . . ."

OSCAR AND IC-451A

(The Perfect Couple)

ICOM presents a multifunction multimode base station transceiver for use either as part of an OSCAR satelite link on mode B or J, or for use with your favorite 440MHz FM repeater. the IC451A incorporates features customers ask for most:

- ☐ 3 Memories with Memory Scan.
- ☐ Programmable Band Scan.
- ☐ Squelch on SSB! Silent Receive when no signal is present.
- ☐ Variable Repeater Split.

Imagine programming 2 of your favorite SSB QSO frequencies as well as the OSCAR 8 mode J downlink beacon into memory, and silently scanning these frequencies while working other bands in your shack.

The IC451A may be ordered from your authorized ICOM Dealer in either 430-439.9999MHz or 440-449.9999MHz models.

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IC-107
LM-324
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IC-107
LM-358

A fresh idea!

Our new crop of tone equipment is the freshest thing growing in the encoder/decoder field today. All tones are instantly programmable by setting a dip switch; no counter is required. Frequency accuracy is an astonishing ± .1 Hz over all temperature extremes. Multiple tone frequency operation is a snap since the dip switch may be remoted. Our SS-32 encode only model is programmed for all 32 CTCSS tones or all test tones, touch-tones and burst-tones.
And, of course, there's no need to mention our 1 day delivery and 1 year warranty.

TS-32 Encoder-Decoder

- Size: 1.25″ x 2.0″ x .40″
- High-pass tone filter included that may be muted
- Meets all new RS-220-A specifications
- Available in all 32 EIA standard CTCSS tones

SS-32 Encoder

- Size: .9″ x 1.3″ x .40″
- Available with either Group A or Group B tones

Frequencies Available:

Group A			
67.0 XZ	91.5 ZZ	118.8 2B	156.7 5A
71.9 XA	94.8 ZA	123.0 3Z	162.2 5B
74.4 WA	97.4 ZB	127.3 3A	167.9 6Z
77.0 XB	100.0 1Z	131.8 3B	173.8 6A
79.7 SP	103.5 1A	136.5 4Z	179.9 6B
82.5 YZ	107.2 1B	141.3 4A	186.2 7Z
85.4 YA	110.9 2Z	146.2 4B	192.8 7A
88.5 YB	114.8 2A	151.4 5Z	203.5 M1

- Frequency accuracy, ± .1 Hz maximum −40°C to +85°C
- Frequencies to 250 Hz available on special order
- Continuous tone

Group B		
TEST-TONES:	TOUCH-TONES:	BURST-TONES:
600	697 1209	1600 1850 2150 2400
1000	770 1336	1650 1900 2200 2450
1500	852 1477	1700 1950 2250 2500
2175	941 1633	1750 2000 2300 2550
2805		1800 2100 2350

- Frequency accuracy, ± 1 Hz maximum −40°C to +85°C
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

Wired and tested: TS-32 **$59.95**, SS-32 **$29.95**

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AWARDS

Bill Gosney WB7BFK
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

I wish to thank the many readers who have supported the *73* Awards Program and this Awards column over the past year and a half. I've received letters from all over the world supporting both projects.

In answer to the many letters received recently, the *73* Awards Program is quite extensive. As you read through the September and October, 1980, editions of *73*, you see featured nearly twenty individual awards being made available to licensed amateurs. We would like to cater to your many ideas for adding a few more awards to the program, but we have to limit our portfolio so that it is manageable by the staff. As we all know, *73 Magazine* is only one function of the Peterborough crew!

Please, don't let my comment discourage you. You people have a lot of super ideas for different awards. Personally, I would recommend that you initiate and fund your award concept locally. What a great way for a radio club, for example, to gain international recognition! Take the Whidbey Island DX Club...with the founding of the International Island DX Award, we have seen applications made from even the rarest of countries and stations. We've seen the popularity of the club and its DX Award grow significantly over the past three years to where now it is the center of attraction.

A radio club award can mean a way of strengthening the club's treasury. Those projects which previously were restricted due to finances now can become reality. The easiest part of it all, once you have your award program organized and can send your rules to me to publish in this column, is just standing by...within a month you'll begin seeing letters of application pouring in.

The most important comment I can offer about a newly-founded award is that it has to be something different to be in demand. So, give your award idea some thought. Plan your requirements with the thought in mind that your award is not for everyone. Make the rules somewhat difficult, yet not too restrictive. Don't make the award so simple that you practically give it away. If an operator doesn't have to work towards a goal, the certificate on the wall won't be of any value to him or those who see it on display.

Finally, I would like to see clubs getting involved with award programs on a larger scale. The majority of award sponsors seem to be major magazine publishers and national radio societies. Somewhere along the line, most of the clubs lost their confidence and only a few have taken the initiative to design an award and offer a challenge to award seekers of the world.

Perhaps now clubs will recognize the significance award programs have to an active group. Why not form a committee and consider such an endeavor this week?

C. O. RADIO CLUB
X1BCI
TORRINGTON CONN. U.S.A.
In recognition of the Courage and Perseverance required to overcome the seemingly insurmountable odds against the establishment of Two-Way Amateur Radio Communications, this Certificate is awarded
CHARTERED OCT. 1947

CQ AWARD

The CQ Radio Club of Torrington offers a certificate for contact with its club members. This is open to any amateur station on any band, any mode, at any time.

To qualify, amateurs within Connecticut must make 15 contacts with members; other stateside amateurs need to contact only 10 member stations; DX stations must establish 5 member contacts.

There are no charges for this award; however, donations to offset postage would be appreciated. Send your list of contacts to: Robert J. O'Neil W1FHP, Awards Manager, Hard Hill Road, Bethlehem CT 06751.

THE HEX AWARD

Paul Hilton N3BCZ recently wrote and provided me with details of an award being sponsored by the Lancaster Radio Transmitting Society, Inc. The award is a beautiful hand-colored certificate, authenticated by the officers of the Lancaster organization.

To qualify, applicants must make contact with at least thirteen Lancaster County radio operators. There are no mode restrictions, but contacts via repeater are not valid.

To apply for the award, send your QSL confirmations to the club trustee. Be sure to enclose sufficient postage for the safe return of your cards. In his letter, Paul failed to mention if there was an award fee. It is assumed there is not. You may forward your application to: Robert Wenger, 402 S. State Street, Ephrata PA 17522.

If you are an active county hunter, which a heck of a lot of our readers are, you might take a hard look at four very challenging awards being offered by Ray Teeter N2RT.

THE UNITED STATES OF AMERICA COUNTY AWARD

The USA County Award is available to applicants who can meet the requirements of any of the 12 award categories.

There is a category for each call district, and an applicant must work the required number of counties in that district to qualify.

1st call district—67 counties
2nd call district—83 counties
3rd call district—94 counties
4th call district—749 counties
5th call district—584 counties
6th call district—58 counties
7th call district—257 counties
8th call district—226 counties
9th call district—266 counties
10th call district—681 counties
Alaskan call district—4 counties (judicial districts)
Hawaiian call district—5 counties

When applying, you *must* state which call district you are applying for. Claiming all call districts requires 12 applications, and the recipient also will receive a nice trophy.

For each Call Area Award, there are three award classes. Class A—all counties in the call area worked; Class B—⅔ of the counties worked in the call area; and Class C—⅓ of the counties worked in the call area.

To apply for the USA County Award, prepare a list of claimed contacts in order by county within each call area. Be sure to list the usual logbook information, including the county and state of the contact. Do not send QSL cards! Have your list verified by at least two amateurs or a local radio club secretary. While there are no mode or band restrictions for this award, you may request endorsements and receive recognition at no additional charge if a request for such is made at the time of application.

For each Call Area Award being applied for, enclose an award fee of $1.00 and forward to: Ray Teeter N2RT, RD 2, Canaan Heights, Locke NY 13092.

CHN MOBILE ACHIEVEMENT AWARD

Also made available by Ray Teeter, the CHN Mobile Achievement Award is offered in three award categories.

To qualify, applicants must either (1) work mobiles in all the counties of any one state, (2) work the same mobile in all counties of any one state, or (3)

Continued on page 44

FULL BANDWIDTH FIREWORKS, 144-148 MHz

KLM'S DUAL-DRIVEN ELEMENTS DO IT AGAIN:
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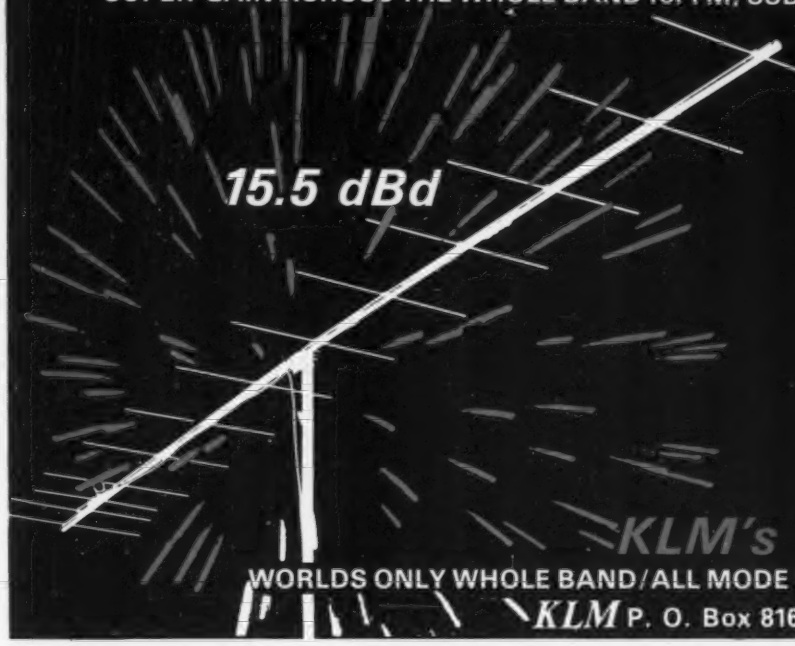

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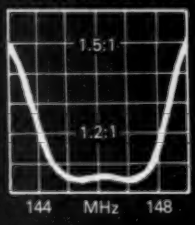

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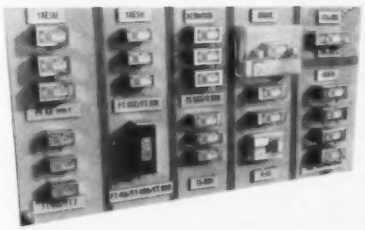

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CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

QRP ARCI ANNUAL QSO PARTY

2000 GMT April 18 to
0200 GMT April 20

The contest is open to all amateurs and all are eligible for the awards. Stations may be worked once per band for QSO and multiplier credits.

EXCHANGE:

Members—RST, state-province-country, and QRP number.

Non-Members—RST, state-province-country, power input.

SCORING:

Each member QSO counts 3 points. Non-member QSOs are 2 points, and stations other than W/VE count 4 points each. Multipliers are as follows: More than 100 Watts input, ×1; 30-100 Watts, ×1.5; 10-30 Watts, ×2; 3-10 Watts, ×4; 1-3 Watts, ×6; less than 1 Watt input, ×10.

Final score is total QSO points times total number of states-provinces-countries per band times the power multiplier.

FREQUENCIES:

Novice—3710, 7110, 21110, 28110.

SSB—1810, 3985, 7285, 14285, 21385, 28885, 50385.

CW—1810, 3560, 7040, 14060, 21060, 28060, 50360.

Try SSB on even hours, and don't forget Novice frequencies.

AWARDS:

Certificates to the highest scoring station in each state, province, or country with two or more entries. Other awards will be given depending on activity. One certificate to highest scoring Novice/Technican overall. One certificate for the station showing three skip contacts using the lowest power.

LOGS AND ENTRIES:

Send full log data, including full name, address, and bands used, equipment, antennas, and power used. Entrants desiring results sheet and scores, *please* enclose a business-sized envelope with sufficient return postage. Logs must be received by May 20th to qualify. Send all logs and data to: QRP ARCI Contest Chairman, William W. Dickerson WA2JOC, 352 Crampton Drive, Monroe MI 48161.

YL ISSB QSO PARTY—PHONE

0001 GMT April 18 to
2359 GMT April 19

Two six-hour rest periods are required. Operating categories include: single operator, DX/WK teams, and YL/OM teams. All bands will be used, and the same station may be contacted on different bands for contact points but not as country multipliers. Two meters may be used, but contacts must be direct and not through repeaters.

EXCHANGE:

Name, RS, SSBer number, country, state, and partner's call. If no partner, leave blank. If non-member, send "No Number."

FREQUENCIES:

3925, 7290, 14332, 21373, 28673. Listen for DX on 3765 and 7090. Listen for VK on 3690 on 75-meter phone, as their top frequency is 3700. It is requested that stations spread out to relieve congestion on 14332. Use frequencies from 14280 to 14345. Remember the nets on 14313 and 14336. Also DX stations use 14160 to 14190 for contacts among themselves.

SCORING:

Score five points for each member contacted on any continent. Non-member contacts count one point. Only member station contacts count for multipliers. Multipliers are each state, country, and province. Also, each team contacted, but

Continued on page 117

CALENDAR

Apr	4-5	ARRL Open CD Party—Phone
Apr	8-9	DX/YL to NA/YL Contest—CW
Apr	11-12	ARRL Open CD Party—CW
Apr	15-16	DX/YL to NA/YL Contest—Phone
Apr	18-19	YL ISSB QSO Party—Phone
Apr	18-20	QRP QSO Party
Apr	25-26	Helvetia Contest
May	2-3	County Hunters SSB Contest
May	9-10	Rocky Mountain Division QSO Party
May	10	DARC Corona 10-Meter RTTY
May	16-18	Michigan QSO Party
May	23-24	Europe and Africa Giant RTTY Flash
Jun	6-7	VK/ZL/Oceania RTTY DX Contest
Aug	8-9	European DX Contest—CW
Aug	15-16	SARTG Worldwide RTTY Contest
Sep	12-13	European DX Contest—Phone
Sep	12-13	G-QRP-Club CW Activity Weekend
Sep	12-14	Washington State QSO Party
Sep	26	DARC Corona 10-Meter RTTY
Nov	8	DARC Corona 10-Meter RTTY
Nov	14-15	European DX Contest—RTTY
Dec	26-31	G-QRP-Club Winter Sports

RESULTS

1980 MICHIGAN QSO PARTY

Michigan

W8PBO	98,600
K8RO	67,235
WA8VNZ	66,470
W8YY	52,445
K8AQM	50,660
WA8MAM	50,150
WA8QAF	42,948
N8ADW/8	41,820
WB8AYW	40,885
WB8ZJL	37,520

Out-of-State

VE3DAP	17,784
K3NB	14,820
W1AQE	8,244
WA9BZW	7,440
N9BNW	6,840
W3PYZ	5,740
W7ULC	5,565
WD8SBR	5,066
K9CW/2	4,536
N3AHA	2,938

RESULTS

1980 HELVETIA CONTEST

Europe

CT4MS	1,764
DK6ZG	16,704
EA7ALG	13,965
F9KP	18,972
G3ESF	10,455
GD4GWQ	945
HA9KDA	17,940
HA7SQ	7257
IN3NJB	5,924
IS0QDV	1,296
LA2GN	4,089
LZ2KKZ	13,650
OE1DSA/3	22,935
OH9NV	15,147
OH3PB	13,572
OK3KFF	9,207
OK1AVD	8,316
ON7YD	10,688
OZ1BLO	1,260
PA3AFF	720
SM4CGM	2,223
SP8ARY	1,938
SP1KRU	1,680
UK4PNZ	29,700
UA2EC	792
UK5IBM	22,680
UK2WAF	21,504
UO5OWC	4,817
UP2BAW	35,787
UQ2MF	1,599
RU2RCU	7,200
YO2BEO	3,306
YU2CRM	8,880
YU3AIJ	5,520
Y43ZN/A	9,360

DX Stations

EA9QT	3,612
JA1ADN	11,664
JT1AN	105
OA4ZP	396
OD5LX	924
PY4KL	741
UA9CAL	22,320
UD6CN	2,160
UJ8JAS	576
UL7QF	1,680
UM8MBA	540
VE2WA	2,592
VE3HNO	351
VE4MF	960
VE5JQ	624
VO1AW	11,172
VK3AEW	2,592
KA1EP	8,694
N2UN	15,675
W3ARK	10,701
W4OEL	20,532
W5EIJ	867
W6UA	9,120
W7ULC	4,860
W8DA	10,062
AE9X	270
W8LHS	108
HB9BAW/4X	20,352
9G1KL	2,304

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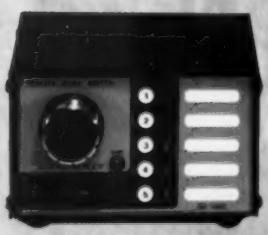

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J-Tron
Springfield

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Texas Tower
Plano

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Tuned Circuit
Harrisonburg
Radio Communications Co.
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Amateur Radio Supply
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C-COMM
Seattle

Wisconsin
Amateur Electronic Supply
Milwaukee

FCC

TYPE-ACCEPTANCE REQUIREMENTS EXTENDED FOR EXTERNAL RADIO FREQUENCY POWER AMPLIFIERS (DOCKET NO. 21117)

The Commission has decided to extend for an indefinite period its type-acceptance requirements for external radio frequency power amplifiers of the kind used to amplify Citizens Band radio transmissions illegally.

The Commission instructed its staff to draft an order extending the type-acceptance and related technical requirements indefinitely. The requirements were adopted in 1978, effective for three years, to cope with the problem created by the large number of amplifiers being marketed and promoted for use in and around the CB frequencies. External amplifiers of the sort used to amplify CB signals illegally can cause serious interference to TV and radio reception.

Type acceptance, in this case, requires submission of a sample of the model amplifier to the FCC for approval, along with technical data, before it is manufactured and placed on the market. The number of prototype units that can be manufactured in preparation for submission for type acceptance is limited to 10.

The requirements apply to all amplifiers and amplifier kits capable of operation below 144 MHz. They cover most amplifiers used in the Amateur Radio Service.

The Commission said numerous manufacturers and distributors of amplifiers designed for illegal operation have ceased manufacture and marketing since the requirements were adopted, though some are continuing.

The effectiveness of the type-acceptance requirements in halting promotion of amplifiers for illegal applications indicates that they should be continued, it said. Notice of the continuation was given in the order that originally implemented the type-acceptance requirement.

Action by the Commission, December 18, 1980, by Second Report and Order (FCC 80-750). Commissioners Ferris (Chairman), Lee, Washburn, Fogarty, and Brown.

CORRECTIONS

In the January, 1981, Review section, the first two TS-820 mod kits (front end and balanced mixer) were incorrectly sourced to S-F Amateur Radio Services. These mods are, in fact, produced by W6TOG, and are available through authorized distributors (S-F is not one). All mail-order inquiries should be directed to the address given below. Both the QRO kit and the Magicom board are available still from S-F at the address given at the end of the review.

Jerome H. Ginsberg W6TOG
TM Limited
6108 Hazelhurst Place, Suite 9
North Hollywood CA 91606

In "A Programmer's Potpourri" (September, 1980, p. 95), Program 11(a), please insert F = 0 at line 0225.

Peter Stark K2OAW
Mt. Kisco NY

In my January, 1981, article "Cheap and Simple," p. 51, an error can be found in the Parts List. Capacitors C1 and C2 should be switched. While this error exists in the Parts List, the text of the article is correct, C1 is 10 uF, 25 V, and C2 is 13,000 uF, 25 v.

Vern A. Weiss WA9VLK
Kankakee IL

LEAKY LINES

Dave Mann K2AGZ
3 Daniel Lane
Kinnelon NJ 07405

Most of us thought that the world had learned its lesson about appeasement when Neville Chamberlain and Edouard Daladier engineered the Munich Pact, thus preparing the way for Adolf Hitler's rapacious appetite for territorial aggrandizement. We thought that appeasement had been thoroughly discredited as a bankrupt tactic, unworthy strategically and unworkable from a practical sense.

It appears that we have not learned that historical lesson, and we may be compelled to relearn it.

We show overweening leniency toward parasites and criminals; we extend the hand of friendship (generally prompted by either economic or political expediency) toward foreign nations which despise us; we lower academic standards so that unqualified boobs can occupy space in our universities, and, closer to home, we grant concessions to the undeserving in amateur radio.

Two things happen when you appease. You sharpen the recipient's appetite for more, and you make it unnecessary for him to appreciate what he has, for he comes to the swift conclusion that he deserved to get it all the time. Giving something for nothing is a certain prelude to disaster.

Through the years, we have witnessed a gradual frittering-away of quality in favor of quantity, and nowhere is this more clearly evident than in ham radio. The implementation of the "mail order" license was a costly mistake. Likewise, the reinstitution of Incentive Licensing was a kick in the teeth, not only to the Amateur Service, but to every ham holding a General class ticket, for it arbitrarily deprived him of privileges once fairly earned and rightfully enjoyed. At the same time, it fell far short of the intended mark, which was to encourage upgrading on a wide scale.

The sad fact is that only a small proportion pursued the golden goal of Extra class. They went as far as Advanced simply because their sole interest in upgrading was to continue operating on accustomed frequencies. I have asked literally thousands of hams why they upgraded, and most had not done it in order to improve skills or knowledge but merely in order to be able to work DX or avoid the congestion in the crowded General portions. Certainly the piddling few kilohertz of sequestered space in the CW portions and in 15- and 75-meter phone bands did not strike anyone as all that attractive, at least not when measured against the difficulty of learning Extra class theory and increasing the CW speed up to twenty words per minute.

I cannot speak for all amateurs, of course, but as a DXer of long standing, I can state with conviction that to those who share that interest with me, there is little point in acquiring the Extra; it is meaningless in real terms.

Newington, ever-obsessed with the idea of recruiting more and more members, has sold itself a delusion: that there is an unlimited pool of potential amateurs out there, and that any and all of them should be recruited through any means, even code-free licensing. Perhaps amateur radio has gained several good people who were at first unqualified, but it is even more likely that there is a huge army of lids who could never be anything but a detriment, no matter what was done for them.

All that separates the deserving from the undeserving is the FCC examination. And for the ARRL to keep granting credence to the idea of an "entry level" code-free license (a cryptic term which means a giveaway) is an absolute abomination, a breach of faith with every League member. The major contributing factor toward the mess on 27 MHz is that anyone can apply and get a license without lifting a finger to prove that he is qualified. The regulations may call for the CBer to possess a copy of the appropriate rules, but he is not required to read them or to be familiar with their provisions. He does not have to know anything, nor does he have to demonstrate his willingness to learn anything. All he needs to do is to buy a piece of equipment, hook it up to an antenna, plug it into the wall socket, and begin yammering into a microphone.

And now the powers that be are again proposing that the door be opened to more unqualified "space cadets," so that they can bring their ignorance into the Amateur Service. Pursuant to a request by FCC Chairman Ferris, and with the support of three "high level" officials on the Commission Staff, a Notice of Proposed Rulemaking is being drafted which is intended to implement a waiver of the code for amateur licenses.

That this ostensibly is aimed at bringing in those who are involved in computer science is altogether beside the point. Of course there is an important future in amateur radio for all sorts of applications of the new digital techniques. An editorial in *QST* for June, 1980, mentioned several areas: station control, contest logging, satellite applications, repeater "bookkeeping," orbital predictions, azimuth-elevation tables, signal processing, automatic error correction, antenna design computations, direction-finding techniques, and message handling. But, as I say, all this is beside the point. The fact is that the doorway to ham radio has never been closed. Anyone with a desire to become an amateur can acquire the necessary knowledge and skill. The only thing that ever stood in the way was an applicant's laziness and inertia.

But the FCC operates on the present-day assumption that high standards are set up as a deliberate bar to the entry of the broadest possible number, that difficult criteria are evidences of some desire to exclude, and are therefore undemocratic. And, instead of opposing this with all the strength at its command, we see our ARRL expressing uncertainty with respect to amateurs' feelings in the matter. I will wager anything that with the possible exception of a few isolated bubble-headed utopian idealists, the huge majority of U.S. amateurs firmly oppose the granting of any code-free license.

Some insist that because some, even most, have no use for CW, it ought to be abolished as a prerequisite. I say, bullfeathers! It may not be in general use by the majority; I won't argue the point. But to me, its chief purpose is to test the willingness of applicants to earn the license.

There are some individuals who can't qualify for driving and flying licenses. They are incapable of sufficient coordination, or their minds can't grasp the written material. But you don't see anyone proposing an "entry license" for them. You don't see bar associations endorsing an "entry level" so that incompetents can practice law, nor do you see a State Medical Board asking for changes that would permit the non-qualified to acquire "entry level" licenses to practice obstetrics or neurosurgery!

Yet, this is precisely what proponents of such schemes are really driving at. Do you seriously believe that they do so because they are sincerely interested in the growth and future of amateur radio? Or is it somehow tenuously connected to a bonanza in the sales of equipment to new licensees? Not that I object to that; it is important to our free enterprise system. But, at the same time, nothing prevents anyone from buying the *License Manual* in order to qualify for a

Continued on page 120

NO-CODE LICENSE?

Here's your chance to speak up! Send us a postcard with your **Yes or No** answer to this question:

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RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

April may be the month for fools, but the biggest fool of all around here would be me if I ignored your letters and questions. So this month let's turn to the mailbag.

Some time back, I mentioned that Dave Lundquist WA2UWK was in need of information for the Lenkurt 25-A demodulator that he had acquired. Indications are that Dave got all the information that he asked for, and more. With the help of Sheldon Daitch WA4MZZ and Rich Strehlow KA0CSG, and who knows how many others, both Dave and I now have a bit more information on the Lenkurt.

This unit was (is?) in use by various wire services to distribute signals on slow-speed teleprinter channels. It is configured to allow tone pairs from around 300 Hz to 7 kHz, center frequency, to be used. Thus, several different signals could share the same line, using different audio tone frequencies, with the differentiation made by the receive filter in the Lenkurt unit. Hopefully, Dave will be able to adapt the thing to amateur RTTY. Good luck, Dave!

There seems to be quite a bit of interest in connecting various teleprinters to low-level TTL circuits. A1C Randy L. Bray, stationed at Bergstrom AFB, Texas, writes that he tried to drive a compact Model 28-KSR Teletype® from a demodulator yielding a TTL-level output. A slight lack of drive there, no? Well, being the industrious serviceman that he is, Randy went on to devise the circuit shown in Fig. 1. This uses a matched pair of 4N25 optoisolators to convert the TTL level to a plus-minus six-volt swing, suitable for driving the polar input of his printer. To take care of occasional upside-down stations, he uses one section of a 7404 TTL hex inverter, which may be switched in to upside-up the upside-down renegade. Looks like a nice piece of work, Randy.

Along the lines of interfacing, Reginald Theriault, from Rimouski, Quebec, is currently using a Model 28-ASR Teletype and a HAL ST-5 demodulator on 60-wpm, 5-level RTTY. He has recently come by a video terminal and wonders how to use it on RTTY. Reg, the terminal you describe is set up, as are most terminals, to use the eight-bit ASCII code, described in RTTY Loop a few months back. As a serial RS-232 output is available, the physical connection of the terminal to a demodulator such as the ST-5 should not be too hard. However, you will be running ASCII, not Baudot/Murray code. Although this is legal in the United States, I am not sure about Canada's viewpoint. Further, most RTTYers are still using Murray/Baudot (try to keep things fair!). There are two main ways to convert to five-level code, if you want to: a stand-alone hardware conversion or a computer.

The hardware conversion would use a UART to input the serial data and convert it to parallel, a ROM and associated chips to look up and change code groups, and another UART to output the transformed code, perhaps at a different speed. This method is cheap, it works, and several schemes have been published in *73* through the years.

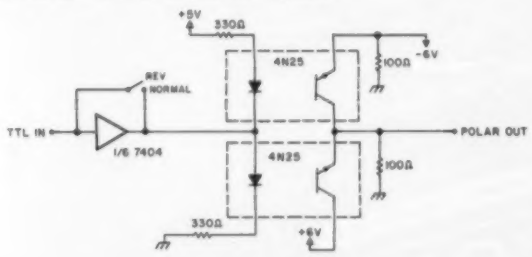

Fig.1. TTL-to-polar conversion.

A computer may be programmed to do the same conversion, from one code to another and back again, and will do it just as well as a simple board, at many times the cost. But what you gain is some intelligence in the conversion. The computer can provide features such as message buffers, automatic identifiers, and other bells and whistles which make operating a real pleasure. Now, I don't think I would run out and buy a computer just to run RTTY, but once you have one you won't believe how many new uses you can find.

This leads us to another question: which computer? Well, from the RTTY point of view, I really don't think that matters much. My biases run toward the 6800 family, but that is because I have one and have written quite a bit of software for it. The TRS-80, by Radio Shack, is clearly one of the most popular microcomputers on the market, spawning accessory suppliers and even whole magazines (have you tried *80 Microcomputing* yet?). A typical question comes from John. T. Gubernard K2LSX, of Bergenfield, New Jersey, who writes that he has a TRS-80 and is looking for ways to get on the air with it.

Guess what else the mail brought? One of our *73* advertisers, Vic Frump K8EXJ, passes along information about his Bit-Byter RTTY system for the TRS-80. This system is designed for either a Level I or Level II computer and has quite a list of features, including split-screen operation, with received information scrolled in the bottom two-thirds of the screen and the transmit buffer in the top third, automatic RTTY and CW identification, single-key CQ, RY, or QBF, and 60- or 100-wpm operation. The unit keys the loop, so interfacing to most systems should be straightforward. Interested? Drop Vic a line at UHF Sales & Service Co., Route 1, Box 52A, Evans WV 25241. Be sure to mention RTTY Loop when you write, OK?

Pictures on RTTY is always a good topic, but, unfortunately, one which has caused quite a bit of concern in these pages in months past. As I write this (in January), there still is no word on the ongoing saga of Teleprinter Art, Ltd. There are pictures out there, however, and you don't have to pay for them! Russ Lawson K1MOU drops me a note that several active hams have reams of pictures they will gladly send to anyone, over the air. Ken WA4MNT, in St. James City, Florida, says that he has quite a few, and W. E. Symons K4IH passes along a similar list as long as your arm.

Most letters I get are questions or requests for this and that bit of information. I would like to acknowledge one this month that was just a nice note. I can remember back a few years, when I was an intern, how tight my time was and how precious every spare moment became. This schedule only gets worse the further into the system you go, through residency and Fellowship. That is why this note, from Joseph R. Salvatore, M.D., now a Fellow at Roger Williams General Hospital in Providence, Rhode Island, means so much. Joe was one of my interns a few years ago, and I lost track of him when he left the area to further his education. I don't know what his callsign is now, but I am sure that he does not have much time to operate. Thanks for reading the magazine, Joe, and best of luck.

Our sister publication, *Kilobaud Microcomputing*, has been giving quite a bit of space to communicating over telephone lines. These Computer Bulletin Board Systems (CBBS) now form a viable means of getting information across the country without worrying about propagation conditions. Users of 6800 systems might be interested in an article in the February, 1981, issue which details the method I use to hook up to the CBBS locally. By the way, if you want to leave me a message, you might try the Baltimore Micro-Mail Service, at (301)-655-0393, calling *only* between the hours of 10 am and 10 pm, eastern time, or the Prodigy system, at (301)-337-8825, available 24 hours a day. Both of these systems are ringback, CP/M-based computers. To access, call the number, let the phone ring once, then hang up and dial again. The computer will answer when you call back in.

Going to look at another piece of equipment next month. What is it? You may not think you need it, but once you've bought one you wouldn't be without it. Curious? Don't miss next month's RTTY Loop!

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ELECTRONIC MAILBOX FOR RTTY

- DELETEF
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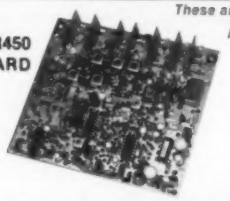

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SCR100 VHF Receiver Board

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- Sens. 0.3 uV/12dB SINAD typ.
- Sel. -6dB @ ± 6.5 KHz, -110dB @ ± 30KHz. (8 Pole Crystal Fltr.)
- 'S Meter' Output.
- Exc. audio quality! Fast squelch! w/0.0005% Crystal.

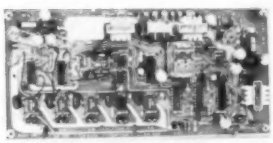
SCR100 Receiver Assembly

- **SCR100 mounted in shielded housing**
- Same as used on SCR1000
- Completely asmbld. w/F.T. caps, SO239 conn., AF GAIN POT, etc.

SCR450 UHF Receiver Bd. or Assy.

- Similar to SCR100, except with 12 Pole IF Fltr. & 8 Resonator Front End Fltr.!
- Discriminator & Deviation Mtr. Outputs
- ***Totally New Advanced Design!***

new



SCAP Autopatch Board

- Provides all basic autopatch functions.
- 3 Digit Access; 1 Aux. On/Off function; Audio AGC; Built-in Timers; etc.
- 0/1 Inhibit bd. also available.
- Write/call for details and a data sheet.

RPCM Board

- Used w/SCAP board to provide "Reverse Patch" and Land-Line Control of Repeater.
- Includes land line "answering" circuitry.

FL-6

FL-6 Rcvr. Front-End Preselector

- **6 Hi Q Resonators with Lo-Noise Transistor Amp (2M or 200MHz).**
- **Provides tremendous rejection of "out-of-band" signals w/out the usual loss!** Can often be used instead of large, expensive cavity filters.
- Extremely helpful at sites with many nearby VHF transmitters to "filter-out" these 'out-of-band' signals.

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- Complete solid state control for rptr. COR, "Hang" Timer, "Time-Out" Timer, TX Shutdown/Reset, etc.
- Includes Inputs & Outputs for panel controls & lamps

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TRA-1 "Courtesy Tone Beeper" Board

- Puts out a tone beep apx. 1 sec. after RX sig. drops—thus allowing time for breakers
- Resets T.O. Timer after "beep"

TMR-1 "Kerchunker Killer" or "Time Out Warning Tone" Bd.

- For **One** of above 2 functions
- "Kerchunker Killer" provides adj. delay (0-10 sec.) for *initial rptr. access.* Auto-Reset at end of QSO.
- T.O. Warning Tone provides alerting "warble tone" apx. 10 sec. before "time out."

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- For SCR-1000 or SCR-4000
- Replaces Darlington Pass Tr.—*for improved reliability*
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- CMOS logic; PROM memory—250 bits/channel.
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SCT110 VHF Xmtr/Exciter Board

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- New Design—specifically for continuous rptr. service
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- 7, 10 or 30 Wt. unit.

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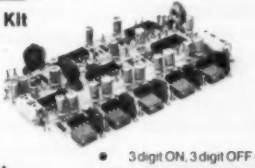
SCT410 UHF Transmitter Bd. or Assy.

- Similar to SCT110, 8-10 Wts.
- Avail. w/ or w/o **OS-18 Super High Stability Crystal Osc./Oven.**
- **BA-40 30W. min. UHF Amp. Bd. & Heat Sink.**



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- 3 digit ON, 3 digit OFF control of a single repeater function. Or, (optional) 2 functions (2 digits ON/OFF each).
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LETTERS

AMATEUR RADIO DAY

About 40 amateurs live in this northwest area of Arkansas, around Rogers. We have secured through the Official Centennial Commission, Saturday, May 9, to be set aside as Amateur Radio Day, as part of the events during the summer. Please help us celebrate that day by working one of the Official Centennial Amateur Radio Stations. The K5BP call letters will be used on about 7,283 kHz LSB or 21,363 kHz USB from 1400 UTC to 2200 UTC. Send confirming QSL card with a #10 SASE to K5BP, Dept. 1881, General Delivery, Rogers AR 72756 to receive an Official Centennial Certificate.

Glenn E. Webster W5VIX
Rogers AR

DE PY2AA

We, from LABRE—Liga de Amadores Brasileiros de Radio Emissao—are glad to announce that there has been set up a beacon, here in Sao Paulo—SP—on the six-meter band, for propagation research purposes.

The beacon is on 50.055 MHz and has an output power of 25 Watts. The antenna is an omnidirectional ground plane which is about 25 feet above the ground level, on the top of the League building.

The format transmitted is a long dash, along with "de" and the call: — de PY2AA.

We would very much appreciate any kind of report; they can be sent directly to PY2AA—Beacon Project, PO Box 22, 01000—Sao Paulo—SP, Brazil.

We will keep you informed on all free local beacon activity.

Hugo Adelino da Silva PY2DSQ
Sao Paulo—SP—Brazil

AND WAYNE SAYS...

There seems to be quite a controversy over Dick Bash's publications, and the fire was recently fueled by Skip Tenney's editorial. If I remember correctly, you were quite enthusiastic about Dick's publications. We find we are being put on the spot by some of our customers after seeing Skip's editorial, and I am trying to feel out some of the more prominent members of the amateur fraternity to determine what their thoughts are on this whole issue.

Warren L. Spindler K2IXN
Ham-Radio World, Inc.
Oriskany NY

Yes, Warren, I have some thoughts on the Bash cheat books. I am not aware of ever having been enthusiastic about them. Indeed, I have refused from the first to allow Bash to advertise in 73, for which we are paying with the loss of about $1,000 per month. I'd say that we are putting our money where my mouth is.

The editorial in HR *about the Bash books was read with entertainment by many. If you will look back in the April, May, and June, 1980, issues of* HR *(and some in* HRH*), you'll find that their Ham Radio Bookstore advertised and sold the book they are now being righteous about. I refused to carry ads for the book or to handle it in our Radio Bookshop.*

As I understand it, HR *was enthusiastic about the Bash books up until they got a call from the FCC. The FCC has been very uptight over the books and I have heard that they called Tenney of* HR *and put it on the line: If he wanted any more FCC information for his Half Right Reports, he should stop advertising for Bash. The ads stopped and the info to* HRR *continued.*

The Bash books are not much worse than the old ARRL Q & A manual in that they strongly encourage the memorization of answers rather than the understanding of theory. I feel that this is bad for those who suck in on this easy way to their first license. This is why my license manuals emphasize learning the theory rather than memorizing answers. Memory quickly fails... and any change of questions quickly confuses applicants. If the theory is understood, not only is any test simple but the foundation for going ahead to higher classes of license has been laid.

The memory route leaves the Novice with no real comprehension of radio theory, so he is then committed to ever more difficult memorization as he goes for the General and Advanced licenses. His ignorance will immediately be perceived by anyone he talks with over the air, making the use of his license less than fun. You can't fool people into thinking you really are a ham when you aren't. They see through the sham.

The really sad part of all this is that there is nothing complicated about understanding the theory. We've had kids four years old able to comprehend it and pass the test. Yes, it takes a bit of time and thinking. You know, it is incredible how much effort people will devote to not having to think! You might get the idea that it is painful to think instead of it being one of the most exciting of human experiences.

Now, to answer your question ...if I were in your position, I would not *sell the Bash books. —Wayne.*

AN UNBIASED VIEW

Just finished reading Larry Kahaner's excellent article, "Who Really Invented Radio?," but found it to be a "floppy copy" of hundreds of other writings, with the exception of a few new names with numbers identifying the modern-day authority of early radio.

Like many others, I also agree that America's N. B. Stubblefield invented, manufactured, and demonstrated a wireless device that transmitted and received both music and voice *before anyone on this planet*, and, like L. H. Hortin, I am tired of explaining that today's radio, as we know it, is Stubblefield's "wireless telephone" transmitter/receiver, and not Signor Marconi's dot and dash performer, or even Tesla's electrostatic transmitter.

Furthermore, English scientific publications such as yours really invented the word *"radio"* —several years *after* Stubblefield's famous broadcast demonstrations—to describe any and all sources of energy that radiated and/or created heat. The truth of the matter is that Stubblefield's scientific "wireless telephone" terminology and achievements were lost to the world by the stroke of a writer's pen, confusing knowledgeable men of both that time and even now! Luckily, Murrayites such as Hortin, Johnson, and many others, who know the real story, still exist.

It would appear that those two radio shack jocks, Riley Ray and William Call (also known as W4LMF and KJ4W respectively), should have known that "wireless telephone" is radio, no matter how you look at it, feel it, broadcast it, or just plain hear it, before tattling Murray's local gossip to the world.

Troy Cory Stubblefield,
Grandson of N. B. Stubblefield,
and son of Oliver Stubblefield
Universal City CA

73 METHODS WORK

I've never written a letter to any magazine before, but I feel I must this time.

I have no technical background or training whatsoever that is electronics or radio-related. In fact, until 1979 I didn't even know how to use a soldering iron! Using your *73* code tapes and theory courses, I have progressed from Novice to Extra class since July of 1979 (just passed Extra class exams January 7, 1981). That's a period of a little over 1½ years, and there is no way I could have done it without the help of your code tapes and study guides.

I can't thank you enough for all that your organization has to offer. Your training and teaching aids are second to none. Keep up the good work and you'll make a lot of newcomers, like myself, very pleased.

Bob Burdick KA1DOS
Ayer MA

PEKING TRAVELS

I read your article in this January's *73* and I thought I should mention that I was in China in December, 1979, and at that time I saw several allband radios in the communes.

In Shanghai, at the Children's Palace (for bright kids), there was a room where the students were assembling transistor radio kits.

I stayed at the Peking Hotel in

Continued on page 123

The New Yaesu FT-902DM

What's so new about the 902?

- **WARC Bands Factory Installed!**
  Your FT-902DM won't be "obsoleted" when the new bands become available.
- **True Reading Frequency Counter!**
  No need to recalibrate when changing bands or modes.
- **Diode Ring Receiver Front End!**
  The industry-standard dynamic range of the FT-901DM is now better than ever.
- **Curtis 8044 IC Keyer!**
  Full dot and dash memory are now provided on the built-in keyer.

What's more, the FT-902DM retains these great features of the '901:

- Variable IF Bandwidth
- Built-in memory system
- Audio peak CW filter
- IF rejection tuning
- SSB, CW, AM, FM and FSK
- Digital plus analog readout
- RF speech processor
- Highly stable PLL local oscillator
- Plug-in modular construction
- AC and DC operation built in

The FT-902DM . . . designed to give you the competitive edge!

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The radio.

Price And Specifications Subject To
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REVIEW

KENWOOD TR-7800

I have operated a lot of different two-meter rigs in my short life, and I am picky. When I first saw the Kenwood TR-7800 two-meter FM transceiver at a show last year, I made several unkind remarks about the rig to my companions. "Ha!" I said. "Look at that ridiculous keyboard entry system. That won't work in the car!"

I now wipe the egg off my face and present my sincerest apologies to my friends, not to mention the poor tortured soul in the booth. This is one of the best two-meter rigs I have ever used! Kenwood has designed this rig to be at home in both base and mobile applications, which is no minor undertaking.

In a way, my first impression was right—the keyboard is not easy to use while driving. What I missed was that it is rarely necessary to use that keyboard at all. This rig is equipped with an extremely flexible memory system, which allows 15 frequencies and their transmitter offsets to be stored in memory and recalled with the push of a button on the microphone. The memories are maintained even when the power switch is off.

Add four AA nicads and the rig will remember your favorite frequencies when there isn't a 12-volt power supply for miles around. No more peering at a washed-out display while fighting rush-hour traffic. No more calling a friend feverishly while your rig is on the wrong offset. Groping for the MHz switch or the 5-kHz button also have been mercifully banished from the two-meter experience. In short, this rig offers just about everything the dedicated FMer could ask for—either in a mobile installation or as a base station.

TR-7800 (front view) with Bird Ham-Mate® Thruline® Wattmeter.

Basic Performance

It's no use having all these sophisticated features if the basic performance isn't up to snuff. Before we go any further, let's examine the 7800's performance characteristics.

The 7800 is very compact, measuring only 6-7/8" wide, 2-1/2" high, and 8-1/16" deep. Electronic performance is excellent. Actually, the design of the receiver and transmitter sections of the 7800 is very similar to that of its older brother, the TR-7625. Many improvements have been made, but the basic design is a tried and proven one. There appears to be some additional filtering in the receiver to increase selectivity, and more reliable finals were used in the transmitter output stage.

Southern New Hampshire is not what could be considered an rf saturated area, so the fact that we never encountered any intermod problems doesn't mean too much. Still, all indications are that the 7800 should handle intermod at least as well as any other top-quality synthesized rig. Squelch action was very sensitive and sharp, more so than other popular rigs we have tested. The squelch control can be set barely above the noise threshold, and weak signals will open the squelch, but noise won't. Received audio is excellent, both through an external speaker and through the larger-than-usual built-in speaker. Since the built-in speaker is top firing, you won't have any problems if you mount the rig on a shelf or the transmission hump of a car.

Transmitter deviation was set perfectly, as was the output of the DTMP encoder. The *73* repeater uses a digital tone decoder, and if the tone levels on a pad are set too high, the decoder rejects them. The TR-7800 has one of the few pads we have seen that doesn't need some adjustment to work properly.

Transmitter output is rated at 25 Watts on high power. Our sample put out over 30 Watts throughout the entire 144-147-MHz range. Low-power output is internally adjustable and we set it at 2.5 Watts. The transmitter's final stage is protected against high swr by sampling reflected power. As swr climbs, transmitter drive is reduced. I left the rig key-down with no load for over a minute, and the only thing that failed was my nerve. I figure that if anyone transmits for more than a minute without any antenna connected, it won't be Kenwood's fault if the finals blow!

Squelched receive current consumption was 0.4 A and maximum current required was 6 A in the high-power transmit mode. The rig draws about 3 mA even when the power switch is off to maintain the frequency and offset memories. Four AA nicad batteries can be installed inside the case to maintain the memories when the rig is completely disconnected from a power source. The nicads will maintain the memories for several days at a time and are automatically charged at 30 mA whenever the transceiver is on.

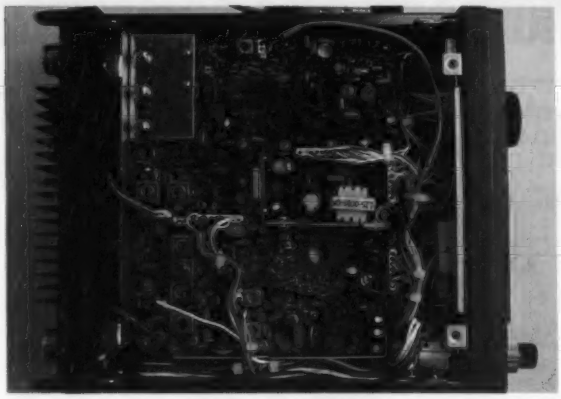
In short, the TR-7800 functions so well that its basic performance characteristics can safely be taken for granted. There is nothing temperamental about this rig, so you are free to enjoy its sophisticated bells and whistles. With no further ado, let's take a good look at those bells and whistles.

Frequency Agility

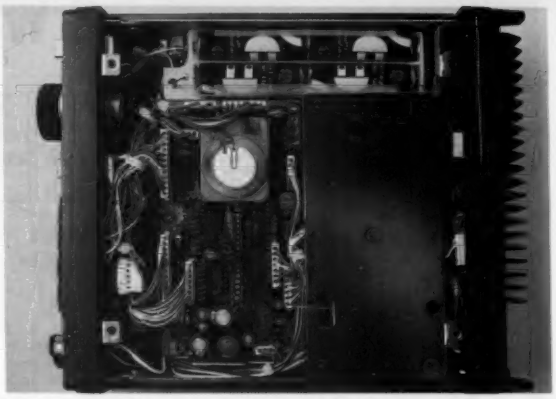
The front panel is fairly simple and the controls are easy to understand. There are several methods of selecting an operating frequency on the 7800. The first is by entering the last four digits of the desired frequency on the keypad. 146.52 MHz would be entered as 6520. If operation other than simplex is desired, the offset also is entered via the keypad.

The second method of frequency selection is to scan through the band using the up/down switches located on the microphone. The band can be scanned in 5- or 10-kHz steps, with an audio tone accompanying each step.

A third way to change frequencies is by depressing the SC button on the front panel. Don't ask me what SC means—I haven't a clue! What it *does* is automatically scan the band looking for signals. When it finds a signal, it pauses for about five seconds and then continues its scan. If you want the 7800 to come to a complete stop, you can press the transmit switch, the C button on the tone



Top view of TR-7800.



Bottom view of TR-7800.

pad, or one of the scan buttons on the microphone.

Each time you change frequencies using one of the above methods, the 7800 reverts to the simplex mode. Let's suppose that you are operating on 146.76, with the transmitter offset set to −600 kHz. If you scan up to 146.85, the rig will revert to simplex, and you'll have to punch the negative-offset button again. This would be annoying if there weren't yet a fourth method of frequency selection. This fourth method of tuning is one of the features that makes the TR-7800 a truly outstanding two-meter rig, and it deserves close examination.

There are fifteen memories available to the 7800's operator and they hold the offset as well as the frequency. Memories 1 through 13 are programmed by entering the receive frequency and a standard offset (+, −, or simplex). Memories 0 and 14 allow the receive frequency and any transmit frequency to be entered separately, so you can operate on any repeater split. Memories are selectable from the scan switches on the microphone, the SC switch on the keypad, or rotary knob on the front of the rig. The large LED readout always displays the frequency of operation, and the smaller two-digit display tells which memory has been selected.

The memories really enhance my enjoyment of two-meter activities. The ability to scan through 15 memories from the microphone makes this rig as safe in mobile use as a crystal-controlled rig, yet it offers almost unlimited frequency options. Since the rig beeps every time it steps through a frequency, you can go from repeater to repeater without even looking at the rig, much less touching it. The little keyboard also works fine, even with my large fingers, but the keyboard is a little too small to be used safely by the driver of a vehicle in motion.

The 15 memories also can be automatically scanned. When you use any rig in the band-scanning mode, it is always stopping on something that you don't want to hear. The 7800's memory scan feature allows you to be very selective about what you listen to.

More Features

I already can hear the screams of protest from all you old codgers who were weaned on big Motorola microphones. Yes, the microphone is small, but it seems to have been carefully designed. Even my massive paws handle it with ease. There is a very good reason for Kenwood's little microphone—stick-shift cars.

Ever try to jam 'er down into third with a big clunky microphone in your hand? Hard to do. You'll have no trouble shifting while holding on to the little Kenwood mike. Clearly, small microphones have arrived!

I have one complaint about the Kenwood microphone: It isn't equipped with a standard hang-up lug. It does have some kind of hook arrangement that is apparently popular in Japan, but since no mating hang-up clip is provided with the radio, you'll have to home-brew your own.

The instruction manual does a fairly good job of explaining how to connect and use the rig, and it contains a good schematic and block diagram. The manual would be a lot more effective if it made better use of the English language. I would encourage Kenwood to have their manuals proofed and edited by a native speaker of English in the future! A separate service manual is also available, but it wasn't ordered in time for review.

Compulsive input checkers will be pleased with the momentary-contact "reverse" switch, which allows one to listen on the input frequency and transmit on the output frequency of a repeater. Priority channel operation is also available. When the priority Alert switch is depressed, the 7800 scans whatever frequency is programmed in channel 0 for activity every five seconds. If there is activity, the rig beeps to let you know. You can switch over to the priority channel by pushing the priority Operate switch. Handy, eh what!

Also on the front panel is a tone switch. Activation of this switch supplies power to a user-supplied CTCSS encoder. Connections are provided inside the rig for ground, post-filter audio input, and +8 V dc. The +8 V dc is supplied only during transmit. The setup is tailor-made for a Communications Specialists encoder, but something could be home-brewed to fit in the space fairly easily.

To those of you concerned that all of this flexibility may be unreliable, relax. I remember a radio (which shall remain nameless) that came out a few years ago offering most of the features of the TR-7800. This disaster was filled with acres of mechanical switches and TTL chips. Naturally, it ran extremely hot and was unreliable. The features of this rig and the TR-7800 may be similar, but the designs are worlds apart. The 7800 uses a single microprocessor rather than discrete logic chips, and its schematic positively reeks of conservative design. It's not at all unreasonable to expect the TR-7800 to stand up to the rigors of daily use and abuse better than more conventional synthesized rigs.

There are a lot of other details that quickly endear the TR-7800 to the jaded two-meter operator. Ever scratched up a rig when you stack your two-meter rig on top of other equipment in the ham shack? Kenwood thoughtfully included four rubber feet that screw into the bottom of the rig. The slide-in mounting bracket included with the rig is one of the slickest acts in town.

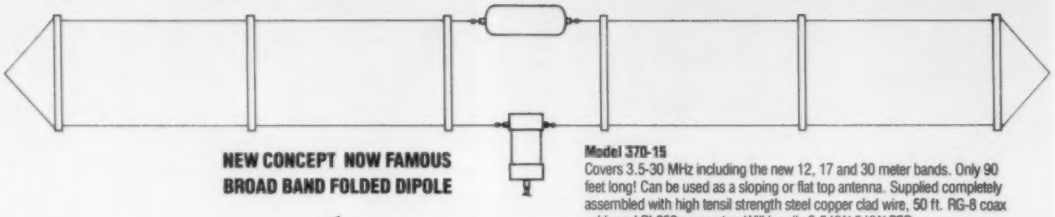
Many rigs have a front-panel layout that makes them difficult to operate in the dark. The knobs and switches on the TR-7800 are carefully shaped and placed for ease of use.

The microphone would need five pins to connect the ground, audio, scanning, and PTT lines to the rig, but the TR-7800 has six pins in its mike connector, leaving a spare for the inventive ham. One possible application that immediately comes to mind is the power connection for a touchtone™ mike or an auto-dialer. Just connect 12 volts to the spare terminal in the mike connector and you're in business!

Conclusion

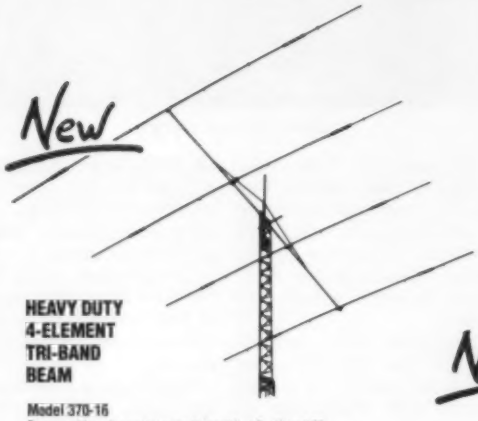
The TR-7800 is one of the most carefully thought out rigs I have ever used. Unlike many other synthesized rigs, the fancy features don't substitute for good performance. This rig's basic characteristics are beyond reproach, and I could explain

B & W NOW OFFERS A COMPLETE



NEW CONCEPT NOW FAMOUS BROAD BAND FOLDED DIPOLE

Model 370-15
Covers 3.5-30 MHz including the new 12, 17 and 30 meter bands. Only 90 feet long! Can be used as a sloping or flat top antenna. Supplied completely assembled with high tensil strength steel copper clad wire, 50 ft. RG-8 coax cable and PL259 connector. Will handle 2.5 KW-5 KW PEP.



New

HEAVY DUTY 4-ELEMENT TRI-BAND BEAM

Model 370-16
Four working elements on each band in 10, 15 and 20 meters. The 24 foot boom permits optimum spacing for maximum foward gain and front-to-back ratio. All traps are precision tuned. Rugged reliability assures ability to withstand winds up to hurricane strength.

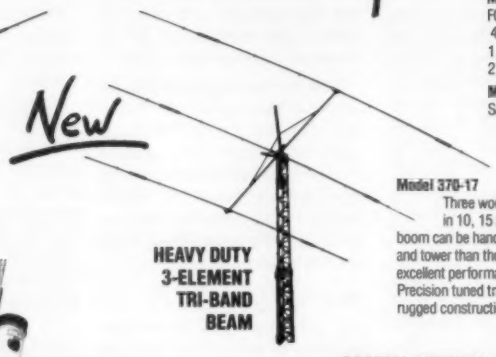
Model 370-11
FIVE BAND TRAP ANTENNA
80, 40, 20, 15 and 10 meters
1,000 Watts
2,000 Watts PEP
All Band Antenna
One Feed Line

Model 370-12
Same as above, in kit form.

Model 370-13
FOUR BAND ANTENNA
40, 20, 15 and 10 meters
1,000 Watts
2,000 Watts PEP

Model 370-14
Same as above, in kit form.

New



HEAVY DUTY 3-ELEMENT TRI-BAND BEAM

Model 370-17
Three working elements on each band in 10, 15 and 20 meters. The 16 foot boom can be handled by a lighter duty rotor and tower than the TB4HA but still provides excellent performance characteristics. Precision tuned traps are combined with rugged construction.

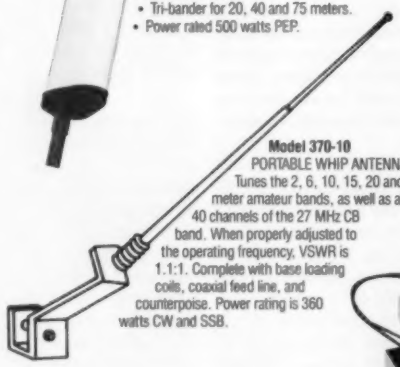
ANTENNA TRAPS

Weatherproof. Strain test over 600 lbs.
Power-1000 watts-2000 watts PEP
Supplied with complete instructions for antenna wire lengths.

Model 370-1
5 Band Antenna Traps for coverage of 80, 40, 20, 15 and 10 meters in one antenna.

Model 370-2
4 Band Antenna Traps for coverage of 40, 20, 15 and 10 meters in one antenna.

Model 370-19
TRI-BAND MOBILE
- Tri-bander for 20, 40 and 75 meters.
- Power rated 500 watts PEP.



Model 370-10
PORTABLE WHIP ANTENNA
Tunes the 2, 6, 10, 15, 20 and 40-meter amateur bands, as well as all 40 channels of the 27 MHz CB band. When properly adjusted to the operating frequency, VSWR is 1.1:1. Complete with base loading coils, coaxial feed line, and counterpoise. Power rating is 360 watts CW and SSB.

COAXIAL ANTENNA CHANGEOVER RELAY

Model 377

Power Rating	1000 watts CW (2000 watts SSB)
VSWR	Less than 1.15:1 DC to 150 MHz
Power Requirements	0.015 Ampere 48 to 130 volts AC
Connectors	UHF Type SO-239

Model 370-5
END INSULATOR
- Space Age Glass Polymer Material
- 1000 lb. Pull Test
- Size 4"L x 1-1/4"D

ANTENNA TUNERS

AT-140
Matches auto antenna to your C.B. rig.

Model AT-200
Matches auto antenna to your 2m Rig.

Model 370-9
PL-259 Connector for use with RG-8 Coax Cable. Mates with SO-239 Connectors. UHF Type.

Model 370-8
50 ft. RG 8 Type coax cable.

Models 370-6, 370-7
ANTENNA WIRE
No. 14 AWG (17/22)
370-6, 70' coil—370-7, 140' coil

Model CC50 Standard

DIPOLE CENTER CONNECTORS
FOR COAXIAL-CABLE FEED

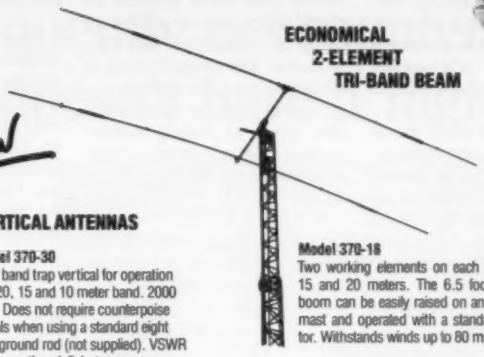
Model CC51 Military Type

Waterproof, mechanically strong connection between a coaxial feed line and the center of a dipole antenna.

ANTENNA PRODUCT LINE

New

ECONOMICAL 2-ELEMENT TRI-BAND BEAM



Model 370-18
Two working elements on each band in 10, 15 and 20 meters. The 6.5 foot aluminum boom can be easily raised on an inexpensive mast and operated with a standard TV rotator. Withstands winds up to 80 mph.

VERTICAL ANTENNAS

Model 370-30
Four band trap vertical for operation 40, 20, 15 and 10 meter band. 2000 PEP. Does not require counterpoise radials when using a standard eight foot ground rod (not supplied). VSWR not more than 1.5:1 at resonance. Includes slimline traps for use as a "flag pole". Overall length is 21 feet.

Model 370-31
RADIAL KIT-ACCESSORY
For 370-30 and 370-32 Verticals on 10-80 meters. All necessary wire and hardware is included for two ground-plane radials for 10-80 meter band.

Model 370-32
Outstanding performance with this omnidirectional, low radiation angle, trap vertical antenna. Requires small installation space for either roof or ground-level. Hardware is included. Traps are precision set at the factory for maximum radiation efficiency on each band with low VSWR. Heavy duty construction withstands winds up to 100 mph.

Models 370-33 & 370-34
75 Meter ADD-ON Kit for models 370-30 and 370-32 antennas.

RADIO FREQUENCY FILTERS

Model Number	Intended Use	Power Capacity (Watts)	Impedance (Ohms)
423	6 Meter	100	50
427	Amateur Radio	1000	50
424	Amateur Radio	100	50
425	TVI Filter	1000	50
426		1000	70
422-15	Amateur 15 Meter	100	50
431-15	Radio Harmonic	1000	50
421-20	Amateur 20 Meter	100	50
430-20	Radio Harmonic	1000	50
420-40	Amateur 40 meter	100	50
429-40	Radio Harmonic	1000	50
419-80	Amateur 80 Meter	100	50
428-80	Radio Harmonic	1000	50
422-2	Amateur 2 Meter Bandpass Filter	350	50

COAX SWITCHES

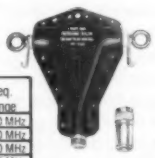
Power 1 KW-2 KW PEP
Impedance 50-75 ohms
VSWR 1.2:1 up to 150 MHz

Model 593	Single Pole	3 Position with grounding of all unused positions
	Dimensions	1-3/4" high, 5" wide, 3" deep
	Mount	Wall or desk
Model 594	2 Pole 2 Position	
	Dimensions	1-3/4" high, 5" wide, 3" deep
	Mount	Wall or desk
Model 595	Single Pole	6 Position with grounding of all unused positions
	Dimensions	8-1/2" x 3-1/2" x 2"
	Mount	Wall or desk
Model 375	Single Pole	6 position with grounding of all unused positions Axial mounted connectors.
Model 590	Single pole	5 position, non-grounding type switch. Axial mounted connectors
Model 590G	Single Pole	5 position with grounding of all unused positions. Axial mounted connectors.
Model 592	Single Pole	2 position switch, non-grounding. Axial mounted connectors.
Model 376	Single Pole	5 position with grounding of all unused positions. Sixth switch position grounds all outputs. Radial mounted connectors.
Model 550A	Single Pole	5 position switch. Radial mounted connector.
Model 551A	2 Pole	2 position. Radial mounted connectors
Model 550A-2	Single Pole	2 position switch. Radial mounted connectors

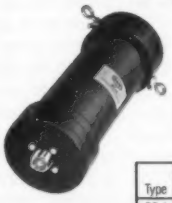
R. F. COAXIAL SWITCHES WITH BNC CONNECTORS

Model 596	Single Pole	3 position with grounding of all unused positions
	Dimensions	1-3/4" high, 5" wide, 3" deep
	Mount	Wall or desk
Model 597	Single Pole	6 position with grounding of all unused positions
	Dimensions	8-1/2" x 3-1/2" x 2"
	Mount	Wall or desk

RECEIVING BALUNS



Type	STANDARD IMPEDANCE RATIOS	Freq. Range
RC-780	50 ohms bal to 50 ohms unbal	3.5-30 MHz
RC-781	70 ohms bal to 70 ohms unbal	3.5-30 MHz
RC-782	150 ohms bal to 50 ohms unbal	3.5-30 MHz
RC-783	200 ohms bal to 50 ohms unbal	3.5-30 MHz
RC-784	300 ohms bal to 50 ohms unbal	3.5-30 MHz
RC-785	600 ohms bal to 50 ohms unbal	3.5-30 MHz
RC-790	50 ohms bal to 70 ohms unbal	3.5-30 MHz
RC-791	70 ohms bal to 70 ohms unbal	3.5-30 MHz
RC-792	150 ohms bal to 70 ohms unbal	3.5-30 MHz
RC-793	200 ohms bal to 70 ohms unbal	3.5-30 MHz
RC-794	300 ohms bal to 70 ohms unbal	3.5-30 MHz
RC-796	600 ohms bal to 70 ohms unbal	3.5-30 MHz



TRANSMITTING BALUNS

Power 2.5KW-5KW PEP
Connectors SO-239

Type	Standard Impedance Ratios	Freq. Range
BC-1	50 ohms bal to 50 ohms unbal	1.8-30 MHz
BC-2	50 ohms bal to 200 ohms unbal	1.8-30 MHz
BC-3	50 ohms bal to 300 ohms unbal	3.5-30 MHz
BC-4	50 ohms bal to 600 ohms unbal	3.5-30 MHz

BALUNS
Commercial & Industrial Types

MODELS AVAILABLE

B&W MODEL NO.	INPUT IMPEDANCE (unbalanced)	OUTPUT IMPEDANCE (balanced)	POWER CAPACITY
HFT-1K-50U-700B	50 ohms	700 ohms	1KW Average 2KW PEP
HFT-1K-50U-600B		600 ohms	
HFT-1K-50U-300B		300 ohms	
HFT-1K-50U-200B		200 ohms	
HFT-1K-70U-As Above	70 ohms	as above	
HFT-5K-50U-700B	50 ohms	700 ohms	5KW Average 10KW PEP
HFT-5K-50U-600B		600 ohms	
HFT-5K-50U-300B		300 ohms	
HFT-5K-50U-200B		200 ohms	
HFT-5K-70U-As Above	70 ohms	as above	

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every function to another ham in less than three minutes. I rarely see a piece of equipment that doesn't have some peculiar flaw that really aggravates me. The 7800 is one of the few that doesn't. If you are about to exchange some of your hard-earned dollars for a two-meter rig, the Kenwood TR-7800 deserves your serious consideration.

For more information, contact *Trio-Kenwood Communications, Inc., 1111 West Walnut, Compton CA 90220.*

Paul Grupp KA1LR
***73* Staff**

KANTRONICS MINI-READER

The age of functional miniaturization is upon us. Kantronics, well established for their reputation in amateur license training tapes and accessories, has released an ultra-compact version of their famous Field Day RTTY/Morse reader.

The Mini-Reader still possesses all of the features of its larger predecessor, but has been reduced to the approximate size of a standard calculator. Measuring only 5-3/4" W × 3-5/8" H × 1-1/4"D, the Mini-Reader features 10 brilliant fluorescent characters. The display moves from right to left, Times-Square style, as the message writes across the full range of alphanumeric characters.

The primary mode is its RTTY/CW reading capability. The Mini-Reader will follow the mark signal at 60, 66, 75, and 100 wpm—any shift. A sharp audio bandpass filter rejects co-channel interference and heterodynes, assuring accurate copy. For CW reception, the Morse function will automatically track 3-80 wpm, self-adjusting to speed. Two of the characters may be used to display the Morse speed.

The Mini-Reader can be used as a code-practice display, assisting the user to develop a perfect fist. If your "v"s look like "e e e t" you have some work to do!

A built-in digital clock shows hours, minutes, and seconds, and may be used as a 24-hour timer as well. And for audio circuit design around the shack, the Mini-Reader can double as a frequency counter from dc to 79 kHz! Computer buffs will find the 100- and 300-baud ASCII a little fast to read, but isolated data sets can be stored and displayed.

We decided to give the Mini-Reader a thorough workout by coupling it to a Kenwood R-1000 general-coverage receiver and seeing how it would perform throughout the shortwave bands. One of the most pleasing observations was made right at the start: no RFI! The Mini-Reader switching circuitry was totally inaudible in the adjacent receiver, meaning that the days of RFI from RTTY demodulators have been relegated to the past, and they won't be missed!

In actual use, the Mini-Reader is simply affixed to an appropriate ac adapter (12 V dc at 240 mA) and plugged into the speaker or earphone jack of the receiver or transceiver. Front-panel push-button selection allows the user to select the functions of his choice.

We found the brilliant fluorescent characters even easier to read than the LEDs of the larger and more expensive Field Day model. And even happier, the price of the Mini-Reader is $150 less than the Field Day II SWL model—$314.95!

We were told by Kantronics that the small size of the Mini-Reader was made possible by abandoning the pure digital circuitry of the earlier Field Day products and programming a microprocessor for control.

The Mini-Reader portends a new breed of microprocessor applications, and amateur radio will benefit from the wave of products.

For more information, contact *Kantronics, 1202 E. 23 Street, Lawrence KS 66044.* Reader Service number 479.

Robert Grove WA4PYQ
Brasstown NC

THE UNIVERSAL COMMUNICATIONS 2300-MHZ DOWNCONVERTER KITS

Coffee cans, snow scooters, and stop-sign-shaped PC boards in every direction. That was the general situation when a group of friends and I recently purchased a number of the 2100-MHz downconverter kits from Universal Communications. These MDS, or pay-TV, converter kits were advertised in *73*, and they seemed like an ideal way to try the rapidly growing frontier of microwave TV. We were not sure exactly what we were getting into, but the enticement of unique movies was definitely an incentive!

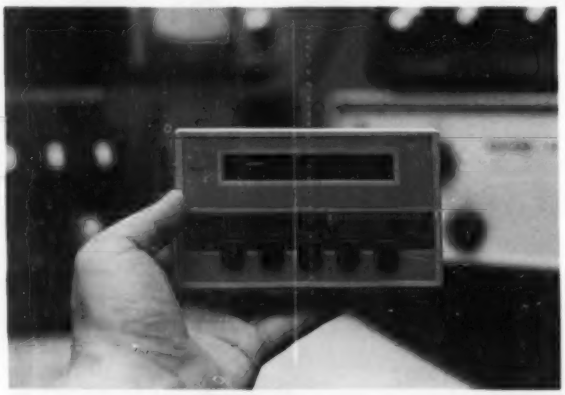
I won't elaborate on our phone-order difficulties, but it soon became apparent that we were in a pileup with the rest of the U.S. in trying to place our order. Fortunately, we got through on the third day of trying. The downconverter kits arrived COD three days later. Fast! The Universal Communications kit consists of the PC board, all associated board parts, a short length of hardline coax which is used for the antenna, and very good instructions/information on microwave techniques.

Construction began (immediately!) by winding three rf chokes on supplied resistors, then mounting all the components on the PC board. The board was then tack-soldered onto the back (bottom) of a one-pound coffee can, with the hardline coax routed through a small hole into a whip antenna. This arrangement provided an approximate 11-dB gain over the basic whip, and perfectly mated the PC board to the coffee can. This one particular trademark, we later learned, is what sets Universal Communications' boards apart from its competitors'.

Finally, the local oscillator's stripline was trimmed to the desired frequency range (a cutting chart was included) and a coax output cable was connected. (This single line feeds dc voltage to the converter while also feeding converter output to the TV set. Varying the voltage remote-controls downconverter tuning.) All six of us sequentially used a borrowed 0-to-16-volt power supply for checkout, and five converters worked the first time. The sixth unit was cleared soon thereafter, with simple soldering techniques being at fault. Each of us then modified existing 12-volt regulated power supplies using information supplied in the Universal Communications packet.

A day later, we were into studying microwave systems, components, and gain-improving techniques for fringe-area setups. Several nearby residents mysteriously lost their shiny, new garbage can lids around this time, then we found a local source of "snow scooters" and gain flourished. The "snow scooter," or "snow coaster," is an approximately three-foot, parabolicly-shaped dish which, when fitted with struts to support the coffee-can setup, provides approximately 18 dB of gain—and relatively good picture reception compared to the basic coffee-can or garbage-can-lid setup. Our personal observations revealed that previous pictures with sustantial snow were improved to almost snow-free quality, and each additional improvement of approximately one dB made further substantially noticeable improvements.

Gain improvement at these microwave frequencies, however, is slow in happening: A larger dish helps; a higher-gain rf amplifier also helps. (Universal Communications also sells these transistors for $15, and they are definitely worth it, unless one can wrangle a very high-gain/low-noise 50- or 75-dollar equivalent.) We also found that adding extra lengths of parallel conductors to the Universal Communications PC board capacitors and using low-noise microwave diodes provid-



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A superb frequency counter is frequently not counted-just because it doesn't have a high price-tag.

The truth is, our 8000B 1 Gigahertz is an excellent counter. In fact, it's preferred by many engineers, technicians, and electronic enthusiasts. Not a single competitor on the market today can surpass our price/performance ratio.

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Like the 8000B, Sabtronics' 8610B is a high-quality precision frequency counter. It features only 4 IC's, and offers a frequency range up to 600 Megahertz.

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ATR-6800
COMMUNICATIONS SYSTEM

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ATR-6800 Standard Features

COMPATIBILITY with any radio transceiver. Simple speaker audio input, no extra equipment, terminal units, etc., required. Everything is built in. Narrow band single tone phase correlation detector for CW, dual tone computer enhanced demodulator for RTTY.

EXTENSIVE SHIELDING and a heliarc welded heavy aluminum enclosure for a degree of RFI immunity that plastic or loose sheet metal cased units cannot touch. Solid quality you can feel.

SPLIT SCREEN OPERATION allows you to type and edit your transmit text (up to 1800 characters) even while receiving. Location of split line (amount of viewable receive and transmit text) is keyboard programmable anywhere on the screen.

UP TO 10 INDEPENDENT MESSAGES of up to 80 characters each can be stored for instant recall.

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HARD COPY PRINTER INTERFACE actually converts any code input to your printer's code and speed. For example, MORSE code inputs to the ATR can be printed on any Baudot machine (Model 28, etc.). Baudot to ASCII or ASCII to Baudot conversion is easy and the line length is programmable.

AUTO-START inhibits display of non-RTTY signals.

AUTO CW ID IN RTTY shifts from RTTY to MORSE, sends your call and automatically shifts back to RTTY.

MICROLOG EXCLUSIVE NON STANDARD TTY SPEEDS plus all standard Baudot and ASCII speeds. (Ap. Mod. No. 1.)

MICROLOG EXCLUSIVE "SYNC-LOCK" ASCII @ 110 and 300 Baud is compatible with all other equipment. Sends standard ASCII codes with extended stop bit which prevents loss of sync on interference hits. This lowers the "info" rate while maintaining ASCII character rate.

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SOLID STATE SWITCHES as well as high speed mercury relay (n.o. and n.c.) keying outputs.

ZOOM DISPLAY MODE doubles the character size for even easier viewing. Video can be black letters on white background or reversed white on black.

TAPE RECORDER INTERFACE for pre-recording your message on standard cassette tape for later retransmission, or for direct recording of received signals or computer programs.

CONVENIENT SCOPE OUTPUT for RTTY tuning and a unique regenerated audio tuning aid for CW, as well as an LED for both modes.

KEYBOARD CONTROLLED TRANSMIT/RECEIVE RELAY for automatic transceive switching.

QUICK BROWN FOX, RYRY in Baudot. U*U* in ASCII and VVV in Morse stored in ROM.

RANDOM CODE GROUPS of 5 characters, MORSE or RTTY, for test transmissions.

INTERNAL 24 HOUR CLOCK displayed on screen may be inserted into transmit text at any time, or used in your computer program.

FULL 63 KEY COMPUTER GRADE KEYBOARD.

KEYBOARD CONTROLLED UNSHIFT on space in Baudot for auto reset to LTRS after reception of space.

VISUAL DISPLAY of all operating parameters shows system status and control commands.

REMOTE COMPUTER TERMINAL via built in RS-232 connector at rates of up to 9600 baud.

APPLICATION MODULE plugs directly into the rear panel connector.

MODULE NUMBER ONE INCLUDES:

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NON STANDARD SPEEDS — ASCII operation at 10 to 100 baud.

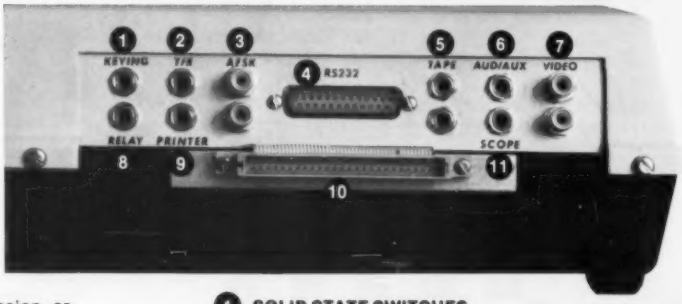
SELECTIVE PRINT — keywords enable/disable printer.

SPECIAL AUTO-START — inhibits display of "non-text" data.

DUMP TAPE — allows user to "dump" selected segments of memory to standard cassette tape.

SYSTEM DIAGNOSTICS — 3 self test modes.

REAR PANEL CONNECTIONS



1. **SOLID STATE SWITCHES**
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5. **RECORDER INTERFACE**
6. **RECEIVE AUDIO IN**
7. **VIDEO OUTPUT**
8. **NO/NC RELAY KEYING**
9. **PRINTER OUTPUT**
10. **APPLICATIONS MODULE CONNECTOR**
11. **OSCILLOSCOPE OUTPUT**

Reader Service—see page 82

FUN!

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Shortwave listening? Why not! While SWLing may not be a part of amateur radio, there's no denying the very close relationship between the two hobbies. While CBing may have usurped SWLing as the main gateway to ham radio, thousands still get their first taste of hobby radio by listening to the international shortwave giants on a portable radio. In any event, it's a well-known fact that many hams are closet SWLs. As a matter of fact, more than one prominent DXer has been known to guard his top shortwave QSLs as jealously as many of his most-prized ham pasteboards.

So, whether the closest you get to shortwave listening is fighting the BBC World Service on 40, or if you regularly scan 41, 19, and 13 meters more often then 40, 20, and 15, the world of SWLing is something we should all know a little more about.

ELEMENT 1—CROSSWORD PUZZLE
(Illustration 1)

Across

1 Belonging to a famous Soviet station
8 Typical shortwave mode (abbr.)
9 Announced
10 Skyhook (abbr.)
12 Shortwave "boundaries" (abbr.)
13 Signal skipping zone (abbr.)
14 Not me, but _____
15 SWL's bible (abbr.)
17 Signal attenuation
20 DX signals usually travel over this
21 Radio interference (abbr.)
22 VOA's Delano transmitter's state (abbr.)
23 Time station
24 High antenna location
27 Receiver (abbr.)
28 British radio organization—not BBC (abbr.)
29 Greek (abbr.)
30 23 across' state (abbr.)
31 VOA's IS—"_____ Doodle"
32 Amateur roundtable (abbr.)

Down

1 U.S. propaganda station
2 Morning (abbr.)
3 Belonging to RAI
4 Below shortwave
5 Former clandestine island
6 Tenth month (abbr.)
7 HCJB's continent
9 Sudanese prefix
11 Immediately
16 Return postage requested (abbr.)
18 Telegraphic regret
19 Broadcast outlet (abbr.)
22 Radiotelegraphic code (abbr.)
23 Logging stations can be hard _____
25 Old boy (abbr.)
26 To desire QSL
29 Morse "good night"

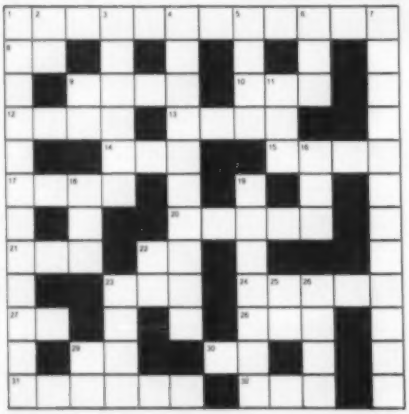

Illustration 1.

ELEMENT 2—MATCHING

While not "shortwave" in a strict technical sense, listening to distant broadcast-band stations is an activity stretching back over 60 years. Here, match the call of the station to its QTH. All stations listed run 50 kW and operate 24 hours a day. All have been licensed since the earliest days of broadcasting.

Column A		Column B	
1)	KDKA	A)	Atlanta GA
2)	WOR	B)	Nashville TN
3)	WWL	C)	Portland OR
4)	KGO	D)	Denver CO
5)	KSL	E)	Spokane WA
6)	KNX	F)	San Francisco CA
7)	WBT	G)	Des Moines IA
8)	WJR	H)	Rochester NY
9)	WSB	I)	Los Angeles CA
10)	WGN	J)	Pittsburgh PA
11)	WLW	K)	Ann Arbor MI
12)	WSM	L)	Philadelphia PA
13)	KOB	M)	Salt Lake City UT
14)	KOA	N)	Cincinnati OH
15)	KYW	O)	Albuquerque NM
16)	WHO	P)	New Orleans LA
17)	WBZ	Q)	Boston MA
18)	KXL	R)	Detroit MI
19)	KGA	S)	New York NY
20)	WHAM	T)	Chicago IL
		U)	Charlotte NC

ELEMENT 3—SCRAMBLED WORDS

Unscramble these words dealing with shortwave listening:

titieslui	catsodrab	plisrotac	tandlicense
dabn	tisecmod	gropram	letnis
sucim	losegiurl	tarlveni	gaugelan
tenrenvomg	granpopada	renegein	servosae
breactila	nefgoir	arlye	tactis

ELEMENT 4—TRUE-FALSE

		True	False
1)	Israel radio has broadcast in the slow-scan television mode.	_____	_____
2)	Radio Moscow regularly broadcasts on 40-meters a show about amateur radio.	_____	_____
3)	Private interests aren't allowed to operate shortwave broadcast stations in the U.S.	_____	_____
4)	Utility stations are owned by public utilities such as power and water companies.	_____	_____
5)	The planet Jupiter can be heard daily on 18, 22, and 27 MHz.	_____	_____

Continued on page 118

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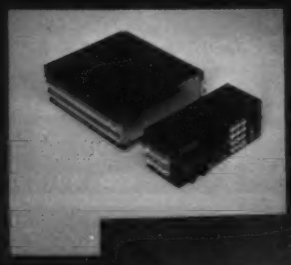

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- **DISCRIMINATOR SCAN CONTROL (AZDEN EXCLUSIVE PATENT):** The scanner stops by sensing the channel center, so the unit always lands on the correct frequency. COMPARE this with other units that claim to scan in 5-kHz steps!
- **THREE SCAN MODES WITH AUTO RESUME:** "Sampling" mode pauses at busy channels, then resumes. "Busy mode stops at a busy channel, then resumes shortly after frequency clears. "Vacant" mode stops at a vacant channel and resumes when signal appears. If desired, auto resume may be prevented by pressing one button. COMPARE!
- **REMOTABLE HEAD:** The control head may be located as much as 15 feet away from the main unit using the optional connecting cable. COMPARE!
- **PL TONE OSCILLATOR BUILT IN:** Frequency is adjustable to access PL repeaters.
- **MICROPHONE VOLUME/FREQ. CONTROL:** Both functions may be adjusted from either the microphone or front panel.
- **NON-STANDARD OFFSETS:** Three accessory offsets can be obtained for CAP/MARS or unusual repeater splits. CAP and Air Force MARS splits are BUILT IN! COMPARE!
- **25 WATTS OUTPUT:** Also 5 watts low power to conserve batteries in portable use.
- **GREEN FREQUENCY DISPLAY:** Frequency numerals are green LEDs for superior visibility.
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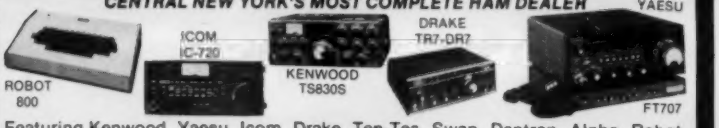

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Simple one- or two-keystroke combinations execute all commands.

The 50-character text buffer can be filled prior to sending (preprogrammed) or it can be filled at any given speed if you type faster than the code is being sent. When the buffer approaches full, the sidetone pitch changes and a red LED comes on to warn you to slow down to prevent buffer overflow.

The 30 characters of programmable memory provide enough memory for contester or DXer when used in conjunction with the 4 automatic messages contained in the keyboard. The 4 automatic messages let you call CQ, CQ TEST, QRZ, and ID without using all of your programmable memory.

Two code-practice modes let you work on your code proficiency. The first mode is pure random code with random-length groups. The second mode is 5-letter groups with 8 separate repeatable lists (with answers) to check your learning progress. Space between letters may be expanded to improve recognition in both modes, and in the second mode you may select alphabet only or alphanumeric plus punctuation.

A meter tells you your sending speed (speed may be set before sending begins), or you may just push a button and the meter tells you how much buffer you have used and how much you have left.

The MFJ-494 Keyboard Keyer.

The model 494 will forgive you for making errors while the buffer is in use. To correct an error, simply backspace over the error and resume typing.

A buffer memory-hold function lets you hold the buffer memory or pause without losing the buffer. You can send with paddles while the buffer is being held; this makes possible operating full break-in.

A push-button lets you key your rig continously for tuning and testing, and a 2-keystroke combination gives you continuous dits for tuning and testing that extends the life of your finals.

The keyboard is also a full-function keyer. Just plug in your

Continued on page 122

GET READY FOR PHASE III with KLM

We've got the whole package!

The time to prepare is NOW. Whether you're already serious about satellite communications, or considering the new Phase III worldwide DX opportunities for the first time, *KLM* has what you'll need.

A prime example is our 420-450 MHz 18 element Circular Polarized antenna. Designed for optimized communications through OSCAR 9, the **420-450-18C** puts the lid on flutter and multi-path fading. And, with it's typical *KLM* broadband response, the 18C also meets the critical needs of DX'ers, ATV'ers, and the 440-450 FM group. Totally new engineering and construction techniques put the *KLM* **420-450-18C** head and shoulders above any competition. The optional CS-2 circularity switcher delivers fingertip control of circularity (RHC-LHC) right to your shack!

We didn't stop with the 18C. There's our Echo 70 transceiver, PA15-110CL linear power amplifier, 144-150-16C circular antenna and switcher, elevation and azimuth rotators, preamps and converters, "Great Little Towers," and more. **YOUR SATELLITE STATION IS AS CLOSE AS YOUR *KLM* DEALER.** Give him a call. For complete information contact:

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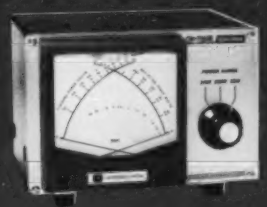
SWR & POWER METERS — Simultaneous SWR/Forward & Reflected Power Readings

Tolerance: ± 10% full scale
Input/output impedance: 50 Ohms
Connectors: SO-239

Model CN-620B (New 2 Kw Scale)

Frequency Range: 1.8—150 MHz
SWR Detection Sensitivity: 5 Watts min.
Power: 3 Ranges (Forward, 20/200/2000 Watts)
(Reflected, 4/40/400 Watts)
Dimensions: 165 x 75 x 97 mm;
6.5 x 3 x 4 in.

Model CN-720B (New 2 Kw Scale)



Frequency Range: 1.8—150 MHz
SWR Detection Sensitivity: 5 Watts min.
Power: 3 Ranges (Forward, 20/200/2000 Watts)
(Reflected, 4/40/400 Watts)
Dimensions: 180 x 120 x 130 mm;
7 x 4.75 x 5 in.

Model CN-630

Frequency Range: 140—450 MHz
SWR Detection Sensitivity: 5 Watts min.
Power: 2 Ranges (Forward, 20/200 Watts)
(Reflected, 4/40 Watts)
Dimensions: 180 x 85 x 120 mm;
7.12 x 3.37 x 4.75 in.

Automatic Antenna Tuner Model CNA-1001

Frequency Range: 3.5—30 MHz (including WARC Bands)
Power Rating: 500 Watts PEP
Internal Dummy Load: 50 Watts/1 Minute
Impedance Matching: 15-250 Ohms to 50 Ohms Resistive
Input Power Required for Automatic Tune: 1, 5 or 10 Watts
(Set by rear panel switch)
Tune-up Time: 45 Seconds Max.
Power Requirement: 13.8 VDC/ 2 Amp

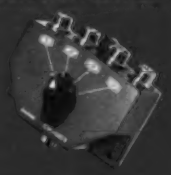
RF Speech Processor Model RF-440

Talk Power: Better than 6 dB
Clipping Threshold: Less than 2 mV at 1 kHz
Panel Meter Indicates clipping level
Bandwidth: 2200 Hz at 6 dB down
Frequency Response: 300-3000 Hz at 12 dB down
Distortion Less than 3% at 1 kHz, 20 dB clipping
Output Level: More than 50 mV at 1 kHz

Coaxial Switches

Power Rating: 2.5 kW PEP, 1 kW CW
Impedance: 50 Ohms
Insertion Loss: Less than .2 dB
VSWR: 1:1.2
Maximum Frequency: 500 MHz
Isolation: Better than 50 dB at 300 MHz; better than 45 dB at 450 MHz; adjacent terminal
Unused terminals grounded
Connectors: SO-239

4 Position/Model CS-401



2 Position/Model CS-201

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CUBIC'S ALL BAND ASTRO-103

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(and you don't have to be a computer expert to use it!)

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Speech Processor

Exceptional Dynamics Noise Floor −132dBm 3rd order intercept +15dBm

RF/IF Gain Controls

Optional CW Narrow Crystal Filter

ASTRO-103 — The Professional Ham Rig.

The Cubic ASTRO-103 expands on the highly acclaimed ASTRO-102BXA with the addition of the most asked for features — RTTY, an input connector for a separate receive antenna, and of course, ALL BAND coverage from 160 through 10 meters, including the new bands at 10, 18, and 24.5 MHz. All bands are operating *now*, nothing to buy later, and of course WWV is covered.

With the optional 400Hz crystal filter installed, which cascades with one of the 8-pole I.F. filters and can be moved through the passband, along with QSK provisions, the ASTRO-103 is the CW operator's dream!

Performance under high cross mod conditions found in todays' crowded bands is second to none. With dual independent high stability PTO's for split band DX and all its other features, the ASTRO-103 is the result of American Technology and American Quality combined to bring the best to the American Amateur.

See your dealer for a demonstration — you won't leave the store without one!

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Cubic Corporation with over 3,500 employees world-wide, including more than 1200 scientists, engineers and technicians, has more than one million square feet under roof.

Established in 1951 the company has grown and expanded in high technology fields, including computer based automatic fare collection systems, electronic countermeasures, supersonic pilot training and other defense and space systems, electronic positioning devices and, of course, communications. New Cubic Amateur products reflect this heritage of excellence and is your assurance of the strength and resources to support your purchase in the years to come.

ASTRO-150A

Another member of the ASTRO family, the ASTRO-150, has been highly acclaimed as the ideal Mobile/Base station. With microprocessor control, VRS tuning and microphone scanning, the ASTRO-150A led the way for competitive radios now appearing on the market.

ASTRO-102BXA

The ASTRO-102BXA provides basically all the fine performance of the ASTRO-103 at a lower cost, but less the WARC bands, which of course may be added later if desired.

CUBIC COMMUNICATIONS, INC.

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70

Yesterday you could admire all-band digital tuning in a short wave receiver.* Today you can afford it.

RF—4900

Tune in the Panasonic Command Series™ top-of-the-line RF-4900. Everything you want in short wave at a surprisingly affordable price. Like fluorescent all-band readout with a five-digit frequency display. It's so accurate (within 1 kHz, to be exact), you can tune in a station even before it's broadcasting. And with the RF-4900's eight short wave bands, you can choose any broadcast between 1.6 and 31 MHz. That's all short wave bands. That's Panasonic.

And what you see on the outside is just a small part of what Panasonic gives you inside. There's a double superheterodyne system for sharp reception stability and selectivity as well as image rejection. An input-tuned RF amplifier with a 3-ganged variable tuning capacitor for excellent sensitivity and frequency linearity. Ladder-type ceramic filters to reduce frequency interference. And even an antenna trimmer that changes the front-end capacitance for reception of weak broadcast signals.

To help you control all that sophisticated circuitry, Panasonic's RF-4900 gives you all these sophisticated controls. Like an all-gear-drive tuning control to prevent "backlash." Separate wide/narrow bandwidth selectors for crisp reception even in crowded conditions. Adjustable calibration for easy tuning to exact frequencies. A BFO pitch control. RF-gain control for improved reception in strong signal areas. An ANL switch. Even separate bass and treble controls.

And if all that short wave isn't enough. There's more. Like SSB (single sideband) amateur radio. All 40 CB channels. Ship to shore. Even Morse communications. AC/DC operation. And with Panasonic's 4" full-range speaker, the big sound of AM and FM will really sound big. There's also the Panasonic RF-2900. It has most of the features of the RF-4900, but it costs a lot less.

The Command Series from Panasonic. If you had short wave receivers as good. You wouldn't still be reading. You'd be listening.

*Short wave reception will vary with antenna, weather conditions, operator's geographic location and other factors. An outside antenna may be required for maximum short wave reception.

Panasonic.
just slightly ahead of our time.

OSCAR ORBITS

Courtesy of AMSAT

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

OSCAR 7 ORBITAL INFORMATION FOR APRIL

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
29169	1	0032:28	85.4
29182	2	0126:35	99.8
29194	3	0025:53	83.9
29207	4	0120:00	97.5
29219	5	0019:26	82.3
29232	6	0113:41	95.9
29244	7	0012:59	80.7
29257	8	0107:14	94.3
29269	9	0006:32	79.2
29282	10	0100:47	92.8
29294	11	0000:05	77.6
29307	12	0054:20	91.2
29320	13	0148:35	104.8
29332	14	0047:53	89.6
29345	15	0142:08	103.2
29358	16	0041:26	88.1
29370	17	0135:41	101.6
29382	18	0034:59	86.5
29395	19	0129:14	100.1
29407	20	0028:32	84.9
29420	21	0122:47	98.5
29432	22	0022:05	83.4
29445	23	0116:20	96.9
29457	24	0015:38	81.8
29470	25	0109:53	95.4
29482	26	0009:11	80.2
29495	27	0103:26	93.8
29507	28	0002:44	78.7
29520	29	0056:59	92.2
29533	30	0151:14	105.8

OSCAR 8 ORBITAL INFORMATION FOR APRIL

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
15650	1	0122:17	78.8
15672	2	0127:03	80.0
15686	3	0131:50	81.2
15700	4	0136:36	82.4
15714	5	0141:22	83.7
15727	6	0002:57	59.1
15741	7	0007:43	60.3
15755	8	0012:29	61.5
15769	9	0017:15	62.7
15783	10	0022:01	63.9
15797	11	0026:48	65.1
15811	12	0031:34	66.3
15825	13	0036:20	67.5
15839	14	0041:06	68.7
15853	15	0045:52	69.9
15867	16	0050:38	71.2
15881	17	0055:24	72.4
15895	18	0100:10	73.6
15909	19	0104:56	74.8
15923	20	0109:42	76.0
15937	21	0114:28	77.2
15951	23	0119:14	78.4
15965	23	0124:00	79.6
15979	24	0128:46	80.8
15993	25	0133:32	82.0
16007	26	0138:18	83.2
16021	27	0143:03	84.4
16034	28	0004:37	59.9
16048	29	0009:23	61.1
16062	30	0014:09	62.3

OSCAR 7 ORBITAL INFORMATION FOR MAY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
29545	1	0050:32	98.7
29558	2	0144:47	104.3
29572	3	0044:05	89.1
29585	4	0138:19	102.7
29595	5	0037:38	87.5
29608	6	0131:52	101.1
29620	7	0031:11	86.0
29633	8	0125:25	99.6
29645	9	0024:44	84.4
29658	10	0118:58	98.0
29670	11	0018:17	82.8
29683	12	0112:31	96.4
29695	13	0011:50	81.3
29708	14	0106:04	94.9
29720	15	0005:23	79.7
29733	16	0059:37	93.3
29746	17	0153:52	106.9
29758	18	0053:10	91.7
29771	19	0147:25	105.3
29783	20	0046:43	90.2
29796	21	0140:58	103.7
29808	22	0040:16	88.6
29821	23	0134:31	102.2
29833	24	0033:49	87.0
29846	25	0128:04	100.6
29858	26	0027:22	85.4
29871	27	0121:36	99.0
29883	28	0020:55	83.9
29896	29	0115:09	97.5
29908	30	0014:27	82.3
29921	31	0108:42	95.9

OSCAR 8 ORBITAL INFORMATION FOR MAY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
16076	1	0010:55	63.5
16090	2	0023:41	64.7
16104	3	0028:26	65.9
16118	4	0033:12	67.1
16132	5	0037:58	68.3
16146	6	0042:43	69.5
16160	7	0047:29	70.7
16174	8	0052:15	71.9
16188	9	0057:00	73.1
16202	10	0101:46	74.3
16216	11	0106:31	75.5
16230	12	0111:17	76.7
16244	13	0116:02	77.9
16258	14	0120:48	79.2
16272	15	0125:33	80.4
16286	16	0130:19	81.6
16300	17	0135:04	82.8
16314	18	0139:50	84.0
16327	19	0001:23	59.4
16341	20	0006:09	60.6
16355	21	0010:54	61.8
16369	22	0015:39	63.0
16383	23	0020:25	64.2
16397	24	0025:10	65.4
16411	25	0029:55	66.6
16425	26	0034:41	67.8
16439	27	0039:26	69.0
16453	28	0044:11	70.2
16467	29	0048:56	71.4
16481	30	0053:41	72.6
16495	31	0058:27	73.8

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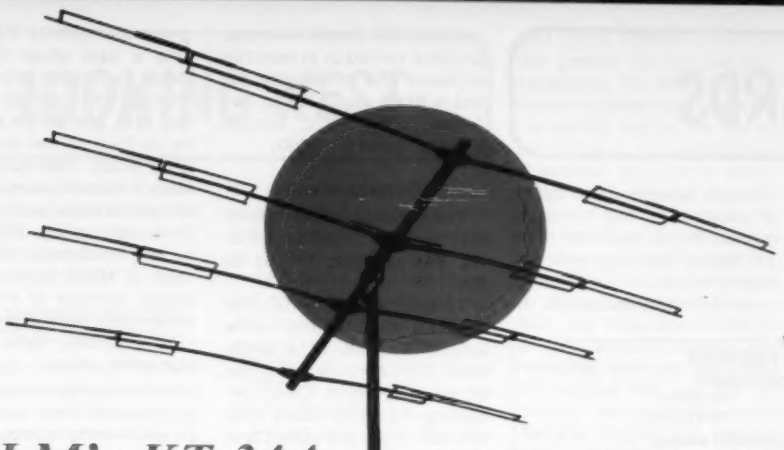
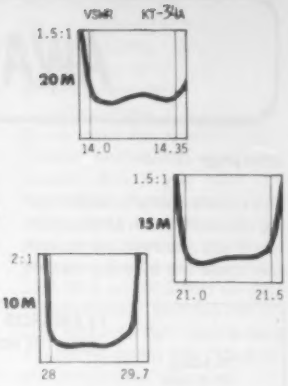




KLM's KT-34A . . . Broadbanded, efficient, compact!

Thanks for your interest in our KT-34A. We're glad to have tickled your curiosity. The KT-34A is a very special antenna, representing the first significant step forward for tribander design in 20 or more years. It is made for the amateur and the equipment of today, and advanced enough to meet the challenges of the future.

What makes the KT-34A so different from a conventional tribander? Basically, the traps, coils, and capacitors have been discarded in favor of lossless linear-loading and Hi-Q air capacitors, all composed of aluminum tubing! These allow the KT-34A to handle 4KW PEP at an unusually high level of **efficiency**. The linear loading also makes full 1/4-wave elements possible on 10 and 15 meters, and brings 20 meters much closer to the desireable 1/4-wave than any conventional tribander (the sketch below shows the remarkable metamorphosis of the KT-34A design).

Two driven elements are employed to make the KT-34A unusually **broadbanded** (a concept applied to most KLM antennas). VSWR and performance remain nearly constant across each of the three bands (see the VSWR charts). A KLM balun is supplied to allow direct feed from your 50 ohm coax.

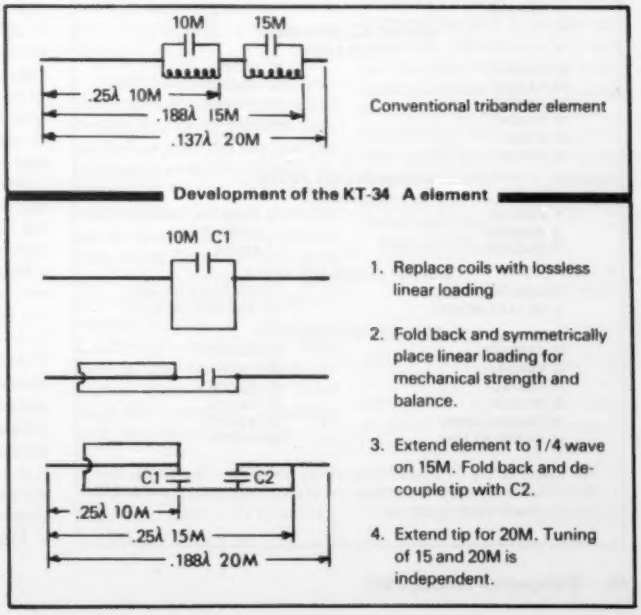
Structurally, the KT-34A is built tough. No boom support is required. All the aluminum, including the boom, is strong weather resistant 6063-T832 alloy. All the hardware is stainless steel except for the mounting U-bolts. Virtually indestructable Lexan insulators support the elements and insulate them from the boom. Rotation is possible by most any ham rotor. Wind balance and wind survival are excellent. Boom length is only 16 feet.

To meet your future needs, the KT-34A is easily expandable. The KT-34XA Upgrade Kit, which adds two new elements and doubles the boom length, produces substantial increases in performance. Your KT-34A cannot become obsolete!

A great deal of thought and care has gone into the design of this antenna. It's not just another "me too" tribander, but one developed from modern techniques, materials and engineering. We hope you will give it a try. We know you won't be disappointed . . . .

KT-34A SPECIFICATIONS

Frequencies of operation:
14.0-14.350 MHz
21.0-21.450
28-29.750
Gain: 7 dBd ± .3 dB across each band
F/S: 30 dB
F/B: 20 dB
Feed impedance: 50 ohms with balun supplied
Power rating: 4KW PEP
Boom: 16 ft. x 3" O.D.
Mast: for 2" O.D. (standard)
Element length: 24 ft. average
Turning radius: 16 ft.
Wind area: 6 sq. ft.
Wind survival: 100 MPH
Suitable Rotors: TR-44, Ham "M", HD-73, KR-400, etc.
Price: $389.95


10M
15M
.25λ 10M
.188λ 15M
.137λ 20M
Conventional tribander element
Development of the KT-34 A element
10M C1
C1
C2
.25λ 10M
.25λ 15M
.188λ 20M
1. Replace coils with lossless linear loading
2. Fold back and symmetrically place linear loading for mechanical strength and balance.
3. Extend element to 1/4 wave on 15M. Fold back and decouple tip with C2.
4. Extend tip for 20M. Tuning of 15 and 20M is independent.

KLM P. O. Box 816, Morgan Hill, CA 95037

AWARDS

from page 12

be a mobile station yourself, giving out contacts in all the counties of any one state. As you can see, there are 50 state awards for each category listed above. A potential of 150 individual awards if you mastered them all! Whew! You may work any band or mode.

As with the other awards, do not send QSL cards! Have your contacts verified by at least two amateurs and forward this list and a $1.00 award fee to Ray Teeter N2RT, RD 2, Canaan Heights, Locke NY 13092.

73 AWARDS PROGRAM

WORK THE WORLD AWARD

72 K2AIO	74 9V1UK
73 N7AKQ	75 VK2VUQ

NORTH AMERICAN CONTINENT AWARD

109 K2AIO	112 VK2VUQ
110 N7AKQ	113 WD8KXT
111 9V1UK	

SOUTH AMERICAN CONTINENT AWARD

98 K2AIO	101 WB2FFY
99 N7AKQ	102 VK2VUQ
100 9V1UK	

EUROPEAN CONTINENT AWARD

125 K2AIO	128 VK2VUQ
126 N7AKQ	129 N3BCZ
127 9V1UK	130 WD8KXT

OCEANIC CONTINENT AWARD

81 K2AIO	83 9V1UK
82 N7AKQ	84 VK2VUQ

AFRICAN CONTINENT AWARD

84 K2AIO	87 9V1UK
85 N7AKQ	88 VK2VUQ
86 WD4LYA	

ASIAN CONTINENT AWARD

79 K2AIO	82 VK2VUQ
80 N7AKQ	83 WB2FFY
81 9V1UK	

73 DX COUNTRY CLUB AWARD
2 x SSB

51 9V1UK	53 VK2VUQ
52 OE1UHB	

DX CAPITALS OF THE WORLD

10 OE1UHB	11 WB0UIA

10 METER DX DECADE AWARD

1 WB4WRE/M	5 DA2AL
2 AC3Q	6 WB4TZA
3 W5TJQ	7 WD5JRG
4 WD0AVG	8 WA4ZLZ

WORKED ALL USA AWARD
MIXED BAND

31 W1AGA	37 K7DBV
32 KA2CLQ	38 KA4JQS
33 KA4BNQ	39 WD8IDD
34 W4DDP	40 KA2GZE
35 AH6AX	41 KA6IYE
36 DF6ZP	

WORKED ALL USA AWARD
75/80 METERS

1 KA0AZQ	4 KS4B
2 WD9BOS	5 WB9UKS
3 KA5AOP	6 KB5FN

DISTRICT ENDURANCE AWARD

1 AJ8L (50 min.)	3 WB6CDM/7 (12 min.)
2 WL7ACY (55 min.)	4 WA3PMI/7 (36 min.)

Q5 AWARD OF EXCELLENCE

32 KA7GKO	38 KA3CBC
33 KA2GMJ	39 KA7HPP
34 KA9FXC	40 WD4PLF
35 VE7DZR	41 KA1FKX
36 KA8GIX (7 MHz)	42 WD9IWC
37 KA8GIX (21 MHz)	43 KA6IYE

Full details of the *73* Awards Program can be found in the August and September, 1980, issues of this magazine. Why not become part of the fastest growing awards program around!

BONANZA AWARD

The Bonanza award is probably the most demanding of all the awards being offered by Ray.

To qualify, applicants must work the same mobile in the various counties of a single state. There are three categories in which to apply. Class A—working the same mobile in all counties of a single state; Class B—working the same mobile in ⅔ of the counties within a single state; and Class C—working the same mobile in at least ⅓ of the counties of a single state.

Both the applicant and the mobile contact will get awards for their efforts. To apply, prepare your list of contact dates and times, band and mode of operation, county and state of operation, and last and most important, the mobile contacted in each case.

Have your list of contacts verified by at least two amateurs or a local radio club secretary. Send a $1.00 award fee and your application to: Ray Teeter N2RT, RD 2, Canaan Heights, Locke NY 13092.

UNION COUNTY AWARD

Here is an historical award being offered by Ray which requires the applicant to work Union counties of the United States.

Offered in three award categories, applicants must, for Class A, work 18 Union counties of the USA; for Class B, work 12 Union countries; and for Class C, work at least 6 Union counties of the USA.

Send your list of verified contacts along with a $1.00 award fee to Ray Teeter N2RT, RD 2, Canaan Heights, Locke NY 13092.

ARMSTRONG PIONEER AWARD

The Major Armstrong Memorial Amateur Radio Club has instituted the Armstrong Pioneer Award, an honor to be bestowed annually on the amateur who has, in the opinion of the voting members, done outstanding service for an amateur community.

Any amateur operator or group of amateurs may nominate a ham whom they feel meets the criteria listed below. Nominations opened November, 1979, and will be accepted for as long as the award program exists. Members of the Major Armstrong Memorial ARC will review each year's nominations every spring, determining by vote the amateur who, in the spirit of Major Edwin H. Armstrong, inventor of Frequency Modulation, has contributed the most to amateur radio through pioneering efforts.

The following criteria should be observed when considering an amateur for nomination: (1) the nominee should be a licensed amateur or group of amateurs; (2) the nominee should have made a significant contribution to ham radio by experimentation and development in new or little-used bands or modes (examples: development of equipment for SSTV, OSCAR, RTTY, EME; revival of neglected modes like facsimile; technical developments that help populate little-used bands, etc.); or (3) the nominee should have made a significant contribution to ham radio by promoting the use of such bands or modes (examples: efforts to keep 10 meters during sunspot minima via nets, clubs, beacons, etc.; efforts to increase activity on 1296 MHz and microwave bands; efforts to keep AM or other obsolete modes alive via nets, contests, etc.; efforts to promote the concept of amateur radio in countries where it is not permitted, etc.).

The examples are only that; the committee hopes the ham fraternity will respond with news of any kind of amateur radio pioneering.

Talk about this award nomination at your next club meeting. Send your statement about the nominee you select to: Major Armstrong Memorial Amateur Radio Club, Inc., PO Box 1234, Englewood Cliffs NJ 07632.

THE REVEREND JOHN FLYNN MEMORIAL AWARD

This award has been instigated by the Alice Springs Community College Radio Club of Australia. It was founded in memory of Reverend John Flynn, who pioneered the Australian Inland Mission, the Royal Flying Doc-

Continued on page 120

LOOKING WEST

Bill Pasternak WA6ITF
c/o The Westlink Radio Network
Suite 718
7046 Hollywood Blvd.
Hollywood CA 90028

THE SIX-METER READER REACTION DEPARTMENT:

Though it's taken some time, we are now really getting input and ideas concerning amateur radio's repopulation of the six-meter band. One of the most interesting letters received came from Lew Collins W1GXT, and it reads:

I read your September, 1980, column, Looking West, with much interest since I have been working on the development of a six-meter bandplan for a number of years. In addition, I have been a user of the band during all those years, and thus feel I am qualified to offer some insights into the six-meter problem that are not available to a passive observer such as you. I am hopeful that the comments that I am offering, which may on the surface sound a bit negative, will be received by you in the constructive spirit in which they are intended.

In my opinion, *three* factors led to the demise of six meters as you remember it: 1) The growth of two-meter FM/repeater operation, 2) The ever-present TVI problem on six, and 3) The decrease in solar activity. Probably item 1), as correctly observed in your article, was the major factor. I claim that the bulk of six-meter activity was of the low-power, rag-chewing local nature that you remember, with a little DX sprinkled in for excitement. The six-meter station with a pair of 4-400s and six-over-six yagis was the exception, rather than the rule.

TVI has always been a serious problem for the six-meter operator, particularly in those areas with channel 2 (Boston, New York, Los Angeles, etc.). The consumer electronic equipment of the 70s not only exists in unprecedented quantity, but the interference rejection properties in general are poorer as manufacturers strive to remain competitive. Many six-meter operators who went QRT because of TVI discovered they could have as good or better local communication without the TVI hassles by getting on the local two-meter repeater. Unknown to you, the diehards with the big rigs and big antennas sat quietly by waiting for the DX openings of 1979-80. Just read a few issues of K5ZMS's newsletter if you don't believe me!

I must take exception with your statement that none of the existing input-output spacings is workable. (Otherwise, why would so many different standards flourish?) I could list numerous counter examples to your claim, but perhaps the most striking is the repeater located on the WCAU-TV tower in Philadelphia which uses 120-kHz input-output separation! This repeater has wide-area coverage and hundreds of users.

The basic parameter in designing a duplex transmission system, such as an amateur repeater, is *not* the number of kilohertz separation between the transmitter and receiver frequencies, but rather the percentage separation. Thus, if we are to adopt 220-MHz standards for use on six meters, the optimum input-output separation is: 1.6/223.5 = 0.0072, which works out to be 380 kHz at 53 MHz. Interesting enough, North Shore RF Technology, who pioneered the notch-type duplexer for the amateur market, produced a six-meter duplexer for 400-kHz spacing.

The 220-kHz separation used in southern California and the 200-kHz value used in eastern New England were both derived the same way, but starting with the now universal 600-kHz separation used on two meters. 0.600/147.0 = 0.0041, which gives 216 kHz at 53 MHz.

There is another side to this input-output separation issue which you totally neglected in your article. While it is true that the greater the input-output separation, the easier it is to make a repeater work, that is not necessarily true for the *system* consisting of *one* repeater plus a *number* of mobile users. Specifically, many of the amateurs who operate six-meter FM use high-quality transceivers which were originally manufactured for the land-mobile market by Motorola, General Electric, RCA, etc. These are not the old vacuum-tube boat anchors you remember from your early days of amateur FM, but are frequently solid-state or hybrid designs offering the state-of-the-art in mobile transceiver performance.

In order to produce a quality transceiver, the front-end as well as the transmitter exciter stages are fairly narrowband to minimize spurious output and responses. Consequently, there is a definite upper limit imposed upon a repeater's input-output separation by the user's radio, assuming that the user desires to have the capability of simplex as well as repeater operation. (It is my observation that most six-meter FMers desire to maintain a simplex capability. In fact, one of the major advantages of six over two is that the simplex working range is greater. That is why I originally got on six meters.)

"...I believe you do not take the amateur radio control enthusiasts seriously enough...they will not QSY without a fight. I would like to see you propose a plan based on FCC regulations as *they now exist*...so that it could be put into effect sooner rather than later."

I must also point out that you have made an error in using and interpreting Carson's Rule. Carson's Rule *does not* say that the bandwidth of an FM signal is infinite, although an *exact* mathematical analysis of an FM signal does lead to that conclusion. What Carson's Rule *does* say is that an FM signal does not have *appreciable* sideband energy outside of the band B = 2f + 2W. All Carson's Rule says is that an FM signal occupies more bandwidth than does AM; practically speaking, both have finite bandwidth.

The issue of whether the repeater or user transmitter should be closer to TV channel 2 is a bit more complex than you have indicated. Although I happen to agree with your position on this matter, others have argued loud and long for the other way around.

Unfortunately, I believe you do not take the amateur radio control enthusiasts seriously enough, and if you have not heard from them by now, it is merely because they have not read your proposal. In my experience, they view 53.1, 53.2, 53.3, 53.4, and 53.5 MHz as their private domain, and they will not QSY without a fight. Space does not permit going into this complex issue here.

There have been numerous attempts over the past ten years to move the national simplex channel from 52.525 MHz to something else, such as 52.520, with no success. There are hundreds (maybe thousands) of six-meter FMers in the less densely populated areas who operate 52.525 MHz exclusively, and, consequently, there is a great deal of resistance to change. I believe that any realistic bandplan will have to accommodate this long-established frequency, even if it doesn't make sense logically.

Your proposed use of 50.00 to 50.25 MHz is slightly at variance with accepted practice there, and needs slight revision. SMIRK, the Central States VHF Society, and other well-known VHF DX groups should be consulted on this point.

In summary, I am in complete support of your appeal for a national six-meter bandplan. However, I believe your proposal has some major flaws which must be corrected if it is to gain acceptance. Otherwise, we will just progress from having N different six-meter plans to having N + 1 such plans. In addition, I would like to see you propose a plan based on the FCC regulations *as they now exist*, so that it could be put into effect sooner rather than later.

Keep up the good work.

Best regards,
Lewis D. Collins W1GXT

As you can see, Lew spent quite a bit of time in preparing his commentary. There is much with which I agree, and points on which I disagree. The important thing is that he took the time to write. Next month, I'll answer Lew's letter. In the meantime, keep your thinking caps on.

Eric Shalkhauser W9CI
527 Spring Creek Road
Washington IL 61571

The History of Ham Radio

—part XIII

Reprinted from QCC News, a publication of the Chicago Area Chapter of the QCWA.

On the lighter side of amateur radio, during the long winter nights, there evolved within the fraternity a new phase of activity. It had its inception in the many curious, humorous, and indescribable stories under the pen name of

The Old Man

who now, through the lapse of time, has become a hallowed legend. The legend is now permanently memorialized in the Wouff Hong Story.

According to research, the ever-present references to the fabulous wouff hong came about like this: In the days when amateur radio was in swaddling clothes, way back in about 1914, there emerged a personality known as the Old Man.

As reality would have it, this individual was, as all amateurs were and are to this day, afflicted with the sad but ever-present problem of raucous disturbances, be they man-made, nature-made, or even fabricated right within the shack of the beholder. This perpetual problem was known in the days of yore as "Rotten QRM." But to go on with the research.

Plagued in the very early days of wireless communication with such interference, driving sane but determined listeners (wishing to remain that way) to distraction, especially when the headphones were securely clamped over both ears, listening intently for what the Morse dots and dashes were meant to convey, there emerged the following effusive but clear and loud verbiage into print [the Old Man exclaiming]:

"Fellows, [all excited and boiling over] fellows, this QRM business is getting my nanny—here it is midnight—I have smoked myself into a state of funk—the floor is covered with burnt matches—I am losing a perfectly good temper—there is no sign this will not continue all night long. . . How long do the radio bugs sit up at night anyway?—What are we going to do about

8 Q S T January, 1917

Rotten QRM

By "The Old Man."

Say, fellows, here's the old man again This time he's all excited and boiling over. In fact he's so wild about some "Rotten" subject that he has fallen back to some queer dialect and shouts about "wouff hong's", "rettysnitches", and some disorder known to the trade as "ugerumf". What do all these mean? Better read the article and see. —Editor.

Smoked himself into a state of funk.

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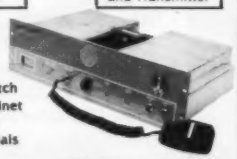

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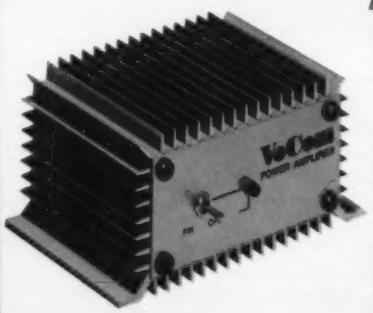

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this business?—When we heard some commercial station say QRM we had to look it up on the chart to see what it meant... Later we began talking to the fellow over on the other side of town, and then was born our amateur QRM.

"But when we have a fellow who has not written to his girl for a full twenty-four hours, and who positively must get the message to her over in Illinois, it becomes a serious matter to have someone else getting gay with the ether, especially when the latter has no conception of the existence of the word 'brevity.' The trouble is, the young squirts don't stop to think. Willy with his sputtering spark coil discharge sends out this hogwash—now listen to this...

" 'Yes yes jst wyd glucky wait a mt muddy wouff hong bliftsky monkey motor.' We assume from this message that Glucky is being asked to wait a minute while Bliftsky seeks a wouff hong with which to wallop a monkey the next time the latter faces towards the motor. I do not think I know just exactly what a wouff hong is. Probably some piece of apparatus used in the southern states to beat monkeys with.

"It is this form of uninteresting 'conversation' which clutters up the air with QRM. Of what moment is it to the rest of the world that this fellow Bliftsky is going to smear somebody's monkey with a wouff hong? When anybody relapses into such a mental slop as to want to operate with a thing named a wouff hong, he ought to keep his trouble to himself and not compel all of us respectable amateurs to listen to his drool. To slave and slobber a lot of foolish twaddle like this when that poor girl in Illinois has not had a letter since yesterday is plain wicked.

"Or just cast a lingering look at this:

" 'Biirgrmph bru rotary ge ge ugerumf om with my set rettysnitch spitty tone hit in potimus?' Now what do you suppose the poor gink was trying to say when he unreeled that? You have to guess a lot in wireless, and how would you guess this? Something is wrong with this fellow's biirgrmph, his rotary also has a bad case of the ugerumf and somebody around the place must have spit on his rettysnitch, because his tone was so rotten it hit him on his potimus. Sounds bad to me. Why will some people send such personal matter by wireless when the whole country can overhear? It isn't decent, and it makes the QRM more rotten than ever, and just think of the way it makes a perfectly good logbook appear.

"I spent the better part of an hour trying to make out what ailed the poor fellow's biirgrmph, but had to give it up. What we ought to do is to organize an Anti-QRM Association. Then let us elect for Chairman the worst plug-ugly we can find in these U.S.A. Then let us chip in a little money and hire a clerk with a bad disposition who will write letters threatening the life of everybody whom the members report as causing needless QRM. Let us rise, fellow bugs—down with the fellow with the scratchy spark coil—down with the fellow, the unspeakable skunk who calls somebody and sends a long relay message repeating each word three times when the station to which he is sending is sending one thing at a time himself.

"There, by heck, I have that stuff off my back and chest. Now you over there in Illinois, get this call—let everybody stand back from now on—I'm tired and sleepy and cross—and I don't care who I QRM, until I get that pin cleared off..."

That was the way the Wouff Hong was brought into being, and it will continue to dominate the cold and blustery nights at ham gatherings to perpetuity—Believe it or not!! ■

THE ORIGINAL WOUFF HONG.

THE OLD MAN

WELL! WELL! WELL! LOOK WHO'S HERE. A picture of THE OLD MAN. It came in the mail, just like all his stories.

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For example, type your call into message A. Then by pressing the CQ button you send CQ CQ DE (message A). Press twice to send twice, etc.

The other automatic messages work the same way: CQ TEST DE (message A), DE (message A), ORZ (message A).

Special keys for KN, SK, BT, AS, AA, and AR.

TEXT BUFFER

The 50 character text buffer sends smooth perfect code even if you "hunt and peck."

Since each automatic or programmable message takes only one buffer character, this gives a far larger effective buffer.

You can preload a message into the buffer. Then when you are ready to transmit press the control key.

You can hold the buffer by pressing the shift key and space bar.

With the buffer in hold, you can send a comment with an external paddle as a keyer. To resume sending buffer, press the control key.

Simply backspace to delete errors.

RTTY: BAUDOT, ASCII

5 level Baudot is transmitted at 60 WPM. RTTY and CW ID are provided via message A.

Carriage return, line feed, and "LTRS" are sent automatically on the first space after 63 characters on a line. After 70 characters the function is initiated without a space. This gives unbroken words at the receiving end and frees you from sending the carriage return.

All up and down shift is done automatically. A downshift occurs on every space to quickly clear any garbles in reception.

The buffer, programmable and automatic messages, backspace delete and PTT control (keys your rig) are included.

The ASCII mode includes all the features of baudot. Transmission speed is 110 baud. Both upper and lower case are generated.

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Build a Frequency Counter— That TALKS!

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The availability of low-cost speech synthesizer technology has opened many doors for the sightless amateur. The introduction of a "talking calculator" several years ago was the first and most affordable example of synthesized speech instruments which are useful to the visually-handicapped amateur.

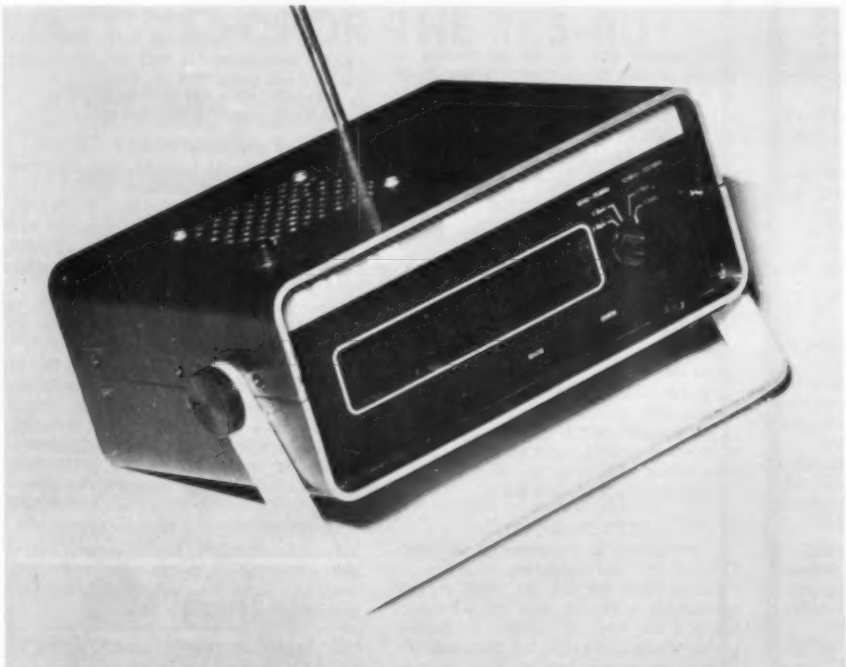

Photo A. There is little evidence that this DSI Model C-700 frequency counter has a voice of its own. The push-button in the left-hand corner of the cabinet top triggers an 8-digit readout. Volume and audio-visual controls are on rear panel.

Through the courtesy of the manufacturer, Telesensory Systems, Inc., of Palo Alto, California, the heart (or, more appropriately, the voicebox) of the Speech Plus Calculator recently has been made available at a reasonable price. Since that time, several efforts have been made to interface this module to available amateur equipment. Most have been relatively complicated, requiring from 10 to 30 or more IC packages.

Thanks to the forethought of the designers, a simple and very easy to duplicate interface is possible, eliminating a major barrier to more widespread use of synthesized speech in digital equipment. The model C-700 frequency counter, manufactured by DSI Instruments of San Diego, California, is based upon the LSI Computer Systems LS 7031 counter IC, which is ideal for this application. Other test equipment may be connected to the synthesizer module in a similar manner. The only

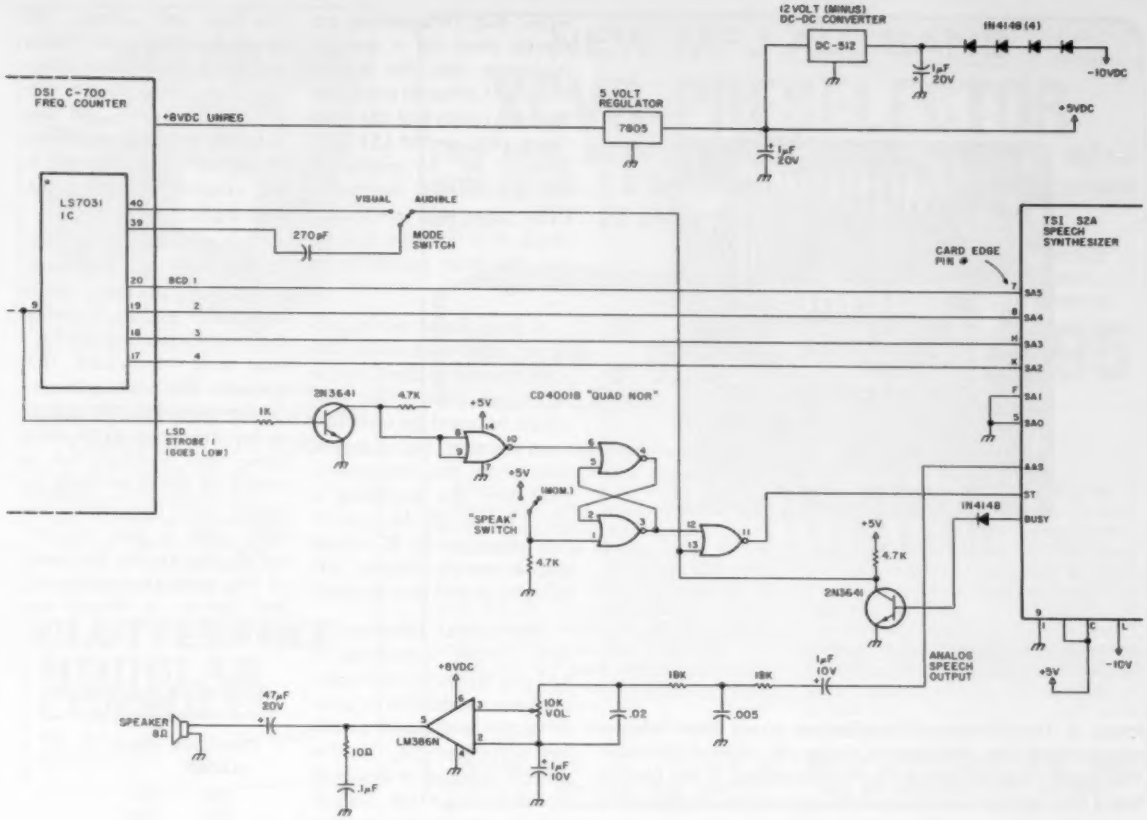

Fig. 1. Talking Counter schematic.

requirement is access to the display multiplexer clock circuit, as will be explained later.

The Telesensory Systems (TSI) model S2A synthesizer module was selected for the Talking Counter. This module provides all ten numerals, plus a few common math and calculator-type words in its 24-word vocabulary (see Table 1). Larger, 64-word models are available, but their higher cost and added features weren't necessary for this application.

The TSI module is easily interfaced to TTL levels using a negative bias voltage which can be easily obtained by use of a small and inexpensive dc/dc converter in systems where a source of minus voltage is not available. In a year of playing with the synthesizer module, it has proven to be quite rugged and resistant to handling and breadboard accidents. So, perish the thought of ruining a $95 board!

TSI provides application notes which offer suggestions on appropriate filtering to eliminate excessive noise and hiss from the digitized audio signal. Since a non-standard audio amplifier was used in the prototype, some changes were made. The filter shown on the schematic is recommended by TSI for the common LM386 audio amplifier IC. Some conditioning is required to make the "Busy" line TTL compatible, but all inputs can be driven directly by TTL or CMOS circuitry.

To make speech, the appropriate BCD code is set up on the S2A input and the Start line is pulsed. Speech will begin on the negative edge of the strobe signal. Also, once speech has begun, the S2A will signal this by means of the Busy line. This pin will go active when the module is "talking," returning to the off state when finished. By simple gating, it is easy to make the speech board say complete words, without "stuttering" or interrupting itself.

In order to make a typical digital display "speak," it will be necessary to start at the left-hand side and step across the display from left to right, "saying" each digit along the way. Some designs choose to latch every digit or to try to get in sync while the display is operating. Neither approach is easy, and neither is necessary, because of what started out as a shortcut for the chip designer.

With a limited number of pins on an IC, it is impractical to dedicate an individual set of digit and segment pins to each digit in a multi-digit display. So, nearly every display designer relies on multiplexed displays, where four common BCD data lines are shared by all digits. Then, each individual digit is turned-on or "strobed" when its data is valid. Since the digit strobes occur pretty often (usually every millisecond or so), persistence of vision makes it appear that each display is lit up all the time. The multiplexing clock runs fast, to avoid flicker, but isn't critical.

It is so non-critical that the chip designer often relies on a simple RC time delay to make the oscillator

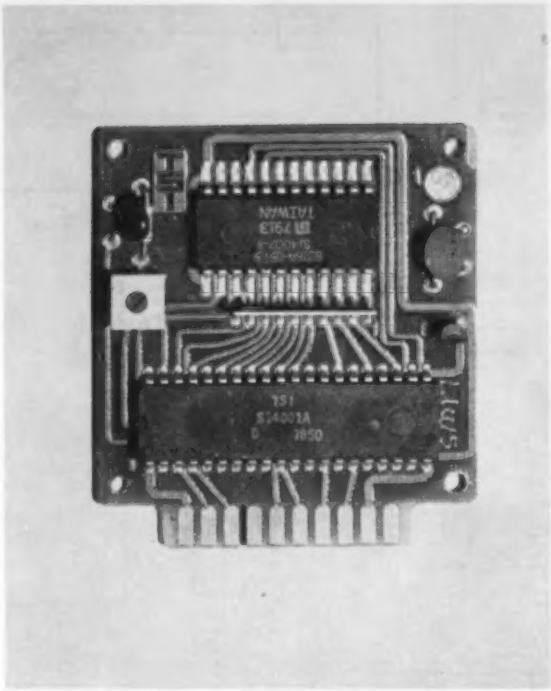

Photo B. The S2A speech synthesizer board from Telesensory Systems, Inc. The large IC is the CRC micro-controller. The entire 24-word vocabulary is contained in the smaller 16K ROM. All connections are by way of the double-sided card edge connector (10 pins per side).

work. But, recognizing potential need for a specific multiplex rate, the designers at LSI allowed provision for user control of the multiplex rate on the LSI 7031 counter IC. By removing the capacitor normally used for the on-board clock, it is possible to control the scan oscillator in the chip.

A Scan Reset pin is provided, which advances the scan counter in the IC to the left-hand digit. This pin could be used to reset the scan counter, but it wasn't found to be necessary. However, by applying a pulse to pin 39, the scan input, the counter IC would step across the display, left to right, just as was desired!

The actual interface is very simple, consisting of just one 40-cent CMOS gate package in addition to power supply and audio amplifier parts (see Fig. 1). The speech readout is initiated by pressing the Speak switch, which sets an R-S flip-flop and allows the strobe line to go true. There will be a short pulse when the Busy line signals the end of the word, and this acts as a clock pulse to move the scan counter in the counter IC on to the next digit.

The process continues until the last digit is spoken, when the positive edge from the eighth counter digit serves to reset the flip-flop and terminate the speech. The only connections required to the counter are the four BCD data lines, the addition of a switch to the scan input to select visual or audible display, and a wire to the eighth digit strobe. Because of the ease of interfacing this circuit, it should be easily duplicated, and

TSI Model S2A Synthesizer Vocabulary List

Data Code (Octal)	Word
000	Oh
001	One
002	Two
003	Three
004	Four
005	Five
006	Six
007	Seven
010	Eight
011	Nine
012	Times-Minus
013	Equals
014	Percent
015	Not used
016	Low
017	Over
020	Root
021	Em
022	Times
023	Point
024	Overflow
025	Minus
026	Plus
027	Clear
030	Swap

Table 1. The "voice" of the S2A is that of Dr. Forrest Mozer, inventor of the speech-generation algorithm used by the LSI controller. The speech synthesizer is a static-sensitive device and normal MOS handling precautions should be observed.

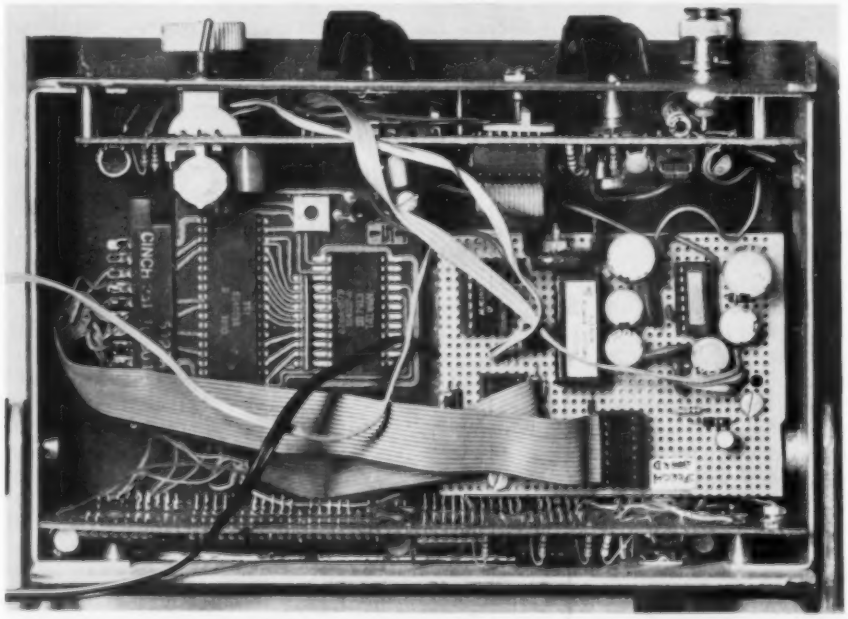

Photo C. Inside the counter. The speech board is visible on the left and the power supply and amplifier-interface circuit board are on the right. Note DIP-plug connections to counter mainframe. Large module at right is dc/dc converter that generates −10 volts for synthesizer. Speaker is mounted to top cover.

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possibly adaptable to other equipment.

A glance at the databook reveals that several popular A/D chips commonly used in digital multimeters and some clock ICs provide similar access to the multiplex scan clock. In fact, just about any device with a multiplexed display would be a good candidate for an artificial voice implant!

Construction is non-critical, and inside the metal DSI case, no problems with rf have been encountered. Removal of the lead-acid battery pack provided plenty of space for the TSI module and the interface/amplifier board. Connections are merely tack-soldered to the counter PC board, with plug-in DIP cables to the added board. Power can easily be robbed from the counter, with a 7805 regulator and the dc/dc converter used to power the synthesizer. Minus 10 volts is needed, but since a minus 12-volt converter was available, a few diodes were used to drop the voltage a bit. Some experimentation may be needed to fine tune the audio filtering for a specific amplifier-speaker configuration. Use of a good-sized speaker helps intelligibility, as does tweaking the clock pot on the S2A board.

Further enhancements could include leading-zero suppression and automatic "point" insertion for locating the decimal. But the added complexity and circuitry required may offset any possible advantage. After a few minutes use, one becomes quite adept at reading frequencies, and frills aren't missed while enjoying the "Cylon-like" sound of the counter!

One idea worth exploring, though, is to separate the "talker" by itself, making it easier to use one synthesizer on several instruments. But in a few years, advances in speech technology will decrease costs enough that one won't mind having a dedicated voicebox in every instrument. In fact, applications for artificial-speech devices are by no means limited to aids for the handicapped.

It is quite handy to check frequency without crawling underneath a dash-mounted radio, or to be able to get a frequency report right from the repeater's mouth. At least one repeater uses the TSI modules for ID and telemetry, and more applications for this versatile and affordable module just await the experimenter's imagination!

A Talking Counter is a valuable tool for the blind ham or technician. The marriage of the DSI counter and the TSI synthesizer is a natural and, hopefully, will open the door for more useful and inexpensive applications of modern artificial speech synthesis techniques. ■

References

1. Model S2A speech synthesizer is available from Telesensory Systems, Inc., 3408 Hillview Ave., PO Box 10099, Palo Alto CA 94304.

2. Information on the LS 7031 counter IC is available from LSI Computer Systems, Inc., 1235 Walt Whitman Rd., Melville NY 11746.

3. The DC-512 dc/dc converter is available for $9.95 each from The Megavision Corporation, PO Box 122, Columbus NE 68601.

↙ Reader Service—see page 82

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Ridgway PA 15853

In the Stack

— R/Cers, don't be grounded by control channel congestion! Put your ship on six!

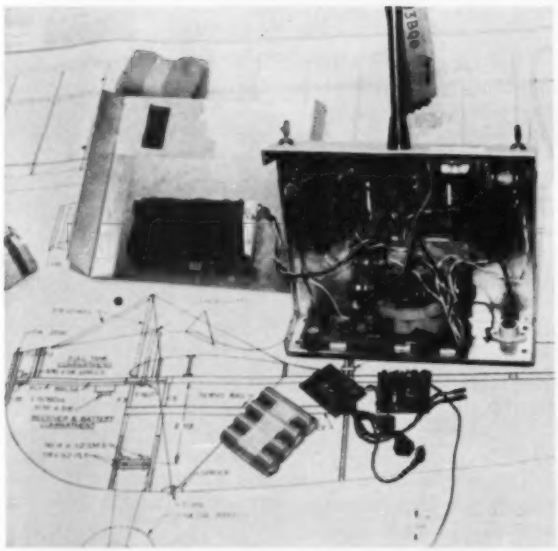

Photo A. Transmitter case open with encoder board at bottom and battery-charging jack at right. Four penlight cells of the flight pack are at left, with the decoder at center and receiver at right. Eight-cell transmitter pack at upper left is held to the rear panel of the case with silicone rubber. Switches at the top of the transmitter case are sixth- and seventh-channel controls. They are for dropping bombs or parachutes, operating retractable landing gear, or anything that does not need to be proportionally controlled.

The model airplane contest is under way. Over a hundred pilots and their planes are gathered in the open meadow. At the pilots' briefing, your radio control frequency is announced as being the most crowded. This means that instead of selecting the time to fly when conditions are best, you must wait to be called to the flight line to fly. Only one R/C rig can be in operation at one time, or the resulting interference will cause the model to crash.

With ten or more pilots on the same frequency as you, the rotation of the roster means a long wait between flights, and being hurried when your name is called. The additional pressure of being on a crowded frequency on top of the usual "first flight nerves" is unsettling and will not help your scores. There ought to be a better way!

For hams, there is a better way. While there are only seven channels for R/C operation in the 72-MHz band for non-hams, there are five channels from 50.100 to 50.500 MHz in the six-meter band. While these are not exclusively for R/C operation, the ARRL and most ham groups throughout the world have agreed to reserve them for radio-control purposes. At a typical contest, there may be four or five hams flying, so the crowding on any particular frequency will be very light. Now, instead of having to wait to be called up to fly, you can pick the best time and choose the right conditions, not being bound by the frequency roster.

While there are several factory-built radios on the six-meter band, most hams prefer to put together a kit. The best known of these is from Heathkit®, and this brand is always well represented at the flying field.

Ace R/C, Inc., of Higginsville, Missouri, and Royal Electronics of Denver, Colorado, also make radio kits for the six-meter band. While all three firms offer some flexibility in the choice of styles in components, Ace seemed to have the widest variety of gear at lower prices than the others.

Since most R/C rigs operate on the same basic principle, the choice of gear comes down to the specific use to which the rig will be put. For small three-foot-wingspan models flown in small spaces such as school yards, the smallest and lightest rig is best. For quarter-scale monsters weighing twenty-five pounds and spanning nine or ten feet, the size and weight of the rig don't mean a thing. It takes very powerful servos powered by large capacity batteries to move the ailerons or elevator on these biggies.

The radio in the photos is the seven-channel kit from Ace R/C, with the transmitter housed in a Royal Electronics case. In operation, the rig controls the plane like this: The pilot's thumbs rest on the two control sticks on the transmitter. Each stick moves both forward and back as well as from side to side. The right stick controls the ailerons (left/right) and the elevator (forward/back). The left stick controls the rudder (left/right) and the motor speed (forward/back). The remaining controls are operated from switches and levers on the front and top of the case—bomb-drop, landing-gear retract, and wing flaps.

Each stick moves a potentiometer which varies the width of a digital pulse that becomes part of a pulse train. The pulse train has a clock pulse and seven data pulses, one for each control. The transmit carrier is turned on and off by the pulse width (A1 emission) set by the pulse train. In the aircraft, demodulated pulses come from the receiver, which is of standard superhet design, to the decoder board. Here, the clock pulse enables the circuitry to route the first pulse after the clock to the elevator, the next pulse to the ailerons, and so on, until all seven data pulses are distributed to the proper servos.

A servo is an electronically-controlled electric motor. It moves an arm that is mechanically connected to whatever control on the plane you wish to control. When the data pulse enters the servo, it is compared to an on-board pulse-generator output which is controlled by a pot, physically positioned by the servo output arm. The on-board pulse is determined by where the arm is currently, while the data pulse from the ground indicates where the pilot wants the arm to be positioned. A difference between these two pulses produces an error, which causes the servo motor to rotate in the proper direction to move the arm/pot combination to reduce the error. At zero error, the motor stops and the servo idles, waiting for a new position indication to be sent up from the ground via the pulse train. While the transmission method is digital pulse, the net effect on the plane is smooth control, since the pulse-recurrence frequency is high enough to preclude stepping of the controls.

In actual use, all this highbrow theory is not important to the pilot and his plane. As the pilot thinks "let's do an axial right roll," his thumb moves the transmitter's right stick to the right, and as the plane half-rolls to inverted, he pushes the stick forward for down elevator, holding the nose up as the second half of the

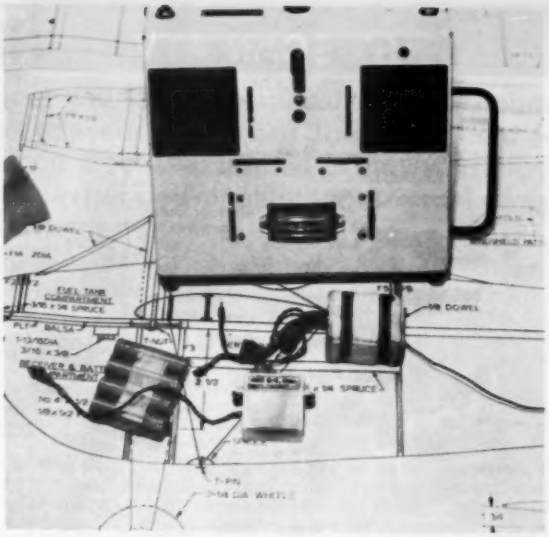

Photo B. The system buttoned up and ready to install in the aircraft. A 6PDT switch (not shown) turns the airborne unit on and off. The receiver/decoder case is covered with thin foam rubber for protection. The servo at lower center is one of four in the basic system.

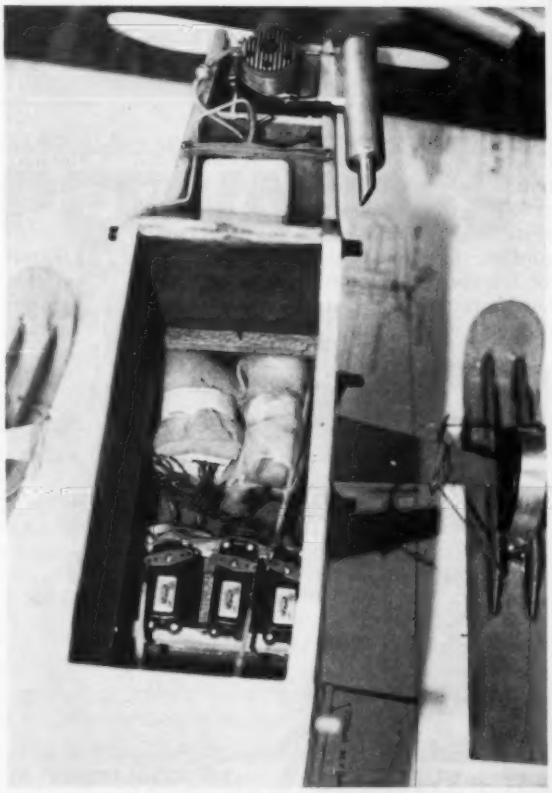

Photo C. The radio room of a typical powered aircraft. Receiver/decoder and battery are both wrapped in one-inch foam to dampen vibration from the engine. The three servos control rudder, elevator, and motor speed.

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roll is completed. The system allows the pilot to make the plane behave realistically, as if under the guidance of a miniature pilot. It allows the pilot to fly famous historical aircraft in the same way that the full-size aircraft were operated, and to try new designs with no personal risk.

The instructions for building the kit are laid out in the same fashion that Heathkit uses. Each step is checked off, with nothing left to chance. The many illustrations make parts placement easy. While the whole system is complex, the sequence of assembly and attention to the smallest detail make it one of the easiest kits to build.

Photo D. The aircraft minus its wing. Power is a .40-cubic-inch engine with 10-inch diameter propeller. The fuel tank (just behind the engine) carries 13 ounces of model engine fuel. The skis are required for operation in that "flakey sunshine" so common to winter in the northeast.

Unlike most amateur gear, this radio operates in a very hostile environment. In powered planes, the engine is a single-cylinder unit and not very well balanced. This 20,000-rpm massage will loosen a poor solder joint in short order. Any metal-to-metal contact produces static noise which can jam the incoming data stream to the receiver. If severe enough, the noise will effectively lengthen the pulses, making the servos all run to one extreme, which could result in a spiral dive into the ground.

Nicad batteries in the transmitter and airborne system have their own requirements of care and feeding and dislike vibration as much as the circuitry does. By using heat-shrink tubing over connector/wire junctions, taping batteries together solidly, and wrapping the receiver and battery pack in foam rubber, the effects of vibration will be greatly lessened.

Ongoing maintenance is the only way to keep the radio from having trouble. To help with this, a monitoring system was built into the transmitter to check on vital voltages. At the top right corner of the transmitter case, a small LED is mounted in a grommet. The LED will not light on less than 8.9 volts and is wired across the string of eight AA cells, which are 9.6 volts at full charge. When the LED goes out, very little time remains for the pilot to land the plane, or gravity will do it for him.

The transmitter encoder uses about 6.0 volts from the battery. A bad cell would not put out the LED, but may tear up the pulse train at the encoder board. For this reason, the meter at the lower center of the transmitter case monitors encoder current and is much easier to see than the LED in full daylight.

Tests of the airborne battery are made using a Heathkit expanded-scale voltmeter, Model GD-1188. It costs about $17.00 and reads the battery under simulated load. Using a mating plug, the meter is connected to the battery through the charging jack at the on-off switch. This tests the cells, all the wiring, and the switch itself, so items most likely to cause trouble are tested as a unit. This is the last check made before the plane is closed up for the day's flying.

The model airplane version of Murphy's Law states that your radio will become inoperative only on the day before the big contest. With a factory-built rig, the only option is to return the radio for service and miss the fun. With kits, all the prints and schematics are on hand, and by knowing how the radio went together originally, the chances of beating Murphy and fixing the problem are very good.

No matter what type of plane your rig ends up controlling—be it a highly-detailed scale fighter or a simple glider—there is no feeling quite like the one you get from flying a plane and radio that you built yourself. And come contest day, when it's time to hand in your transmitter at the impound desk, it will feel great to be able to say to the official that your rig is the custom job on six meters. ■

R/C Kit Manufacturers

Ace R/C, Inc.
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Royal Electronics, Inc.
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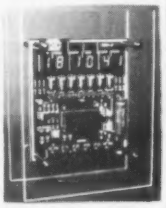

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All the News that Fits

—make your club newspaper a winner!

Wouldn't it be neat if . . . ! It would be a great idea to have our own . . . ! What great editorials I could write . . . !

Have you had these ideas in your mind lately, only to be stymied by the logistics involved? Do you have newsprint in your veins? Were you captivated, as a child, by the miniature print set you received from Santa Claus? (I never did get the knack of setting the type correctly with my super duper mini-print shop.) Have you mentioned the idea of having your own newspaper at a club meeting only to open the floodgates to who, what, where, why, and, more to the point, how?

Let's investigate the possibilities.

Why have a club newspaper? Amateur radio is communication. Most news is spread via the radio on club nets. So why have a newspaper? The same argument could be applied to television news. Most of us watch the up-to-the-minute local and international news on our favorite TV channel, but many of us also grope in the early dawn to fish out the newspaper from the bushes to read what we heard about the night before. Newpapers give substance to the news. We can learn more when we read (and reread). When the facts are clearly stated in black and white, then we learn at leisure.

We read newspapers to find out what's happening, to catch up on what we missed, and to learn more details about the events we're interested in—to be in the know.

Club newspapers do all this and more. More, because it's a local paper giving tidbits of information about people we know and things we ourselves are involved with. The club newspaper is a uniting factor, keeping everyone up to date and making members more active. Even inactive members feel more a part of the club when they read their club newspaper.

Although club activities are important to club members, most things are not national news to be printed in *QST* or other amateur journals. So, members have a chance to see their name in print, to be congratulated in upgrading or to be congratulated (or consoled) on their recent marriage, or birth of a new baby or grandchild, or anniversary—things that are important to us as people. (Much to the amazement of many, hams are people, too!) The club newspaper unites members on a social basis.

A ham is more likely to communicate about his latest antenna than to mention on the air that he is a newlywed or that the new baby is keeping him up nights. Getting to know one another on a social basis as well as on the air is a good way of keeping a club active and growing. We feel more like friends than just radio comrades.

Club newspapers are more than just club newspapers. That's right, club newspapers are publicity or public relations for amateur radio. The best public relations are not necessarily the biggest, flashiest commercials with catchy tunes behind them. The best public relations is everyday personal contact.

Ask a doctor or dentist what his best source of advertising is. He will probably tell you he doesn't advertise, that his patients are referred from other patients (word of mouth). Even with regard to a movie or a show or a restaurant, we tend to value our friends' opinions and recommendations. Their personal comments will sway us. If Tom said the restaurant had terrific food, Dick might try it. If he doesn't like the food, he'll think Tom has terrible taste.

But he tries it; he looks into it because his friend suggested it. With hundreds of thousands of amateurs around, amateur radio has its best publicity potential in its own people. This tells us all to be amateur radio conscious. Mention it in conversations; wear "I Am a Ham" T-shirts. T-shirt slogans are the rage. Everyone wears them. How about "Ride the Radio Waves with Amateur Radio"? Think of something creative and wear it! Wear your handheld radio on your belt. (Don't forget the ham radio belt buckle.) When people ask you if you're a police-

man, say, "No. This is amateur radio." Pull out a copy of your club newsletter and hand it to them.

You see, your club newsletter makes amateur radio a more tangible thing. People can look at it, read it, and perhaps become curious about "these crazy people." (I have wondered in the past if it is a requirement that a person be crazy to become a ham.) One way or another, the whole world is crazy, so we're all susceptible to the magic of amateur radio. All amateur radio needs is exposure.

Take extra copies of your newsletter with you in your car and pass them around. Leave them in your employee cafeteria for others to see. Give beginning amateur radio books and kits for Christmas presents. Start a ham station where you work. In amateur radio publicity, it's the little things that count. If everyone does a little, amateur radio will have a lot.

In our investigation of "why" an amateur radio club newsletter, we have delved into the "what." A club newspaper can be anything from a one-page edition to a twelve-page paper (or more).

Where does the money come from? Most clubs are their own publishers and take the funds from the club treasury. Usually, the treasury is supplied from club dues, hamfests that were held, or even raffle money. It is evident that in most clubs the treasury is not an unlimited source of supply.

Cost is a relevant factor in the type of newspaper your club will have—the kind of paper, printing, number of pages, etc. One big expense is postage. Check to see if your club qualifies for nonprofit bulk mailing privileges with the post office. However, going first class does have its advantages. The main advantage is that the member receives the newspaper within a respectable amount of time. I have received bulk mail as much as two weeks after the proposed event even though the senders felt they mailed it early.

Most club newspapers that I have seen use one 15-cent stamp and sometimes have double issues with 28 cents in stamps. If standard 8½" × 11" paper with a sub weight of 20 is used, one stamp will cover six sheets (12 pages) if no envelope is used. Just fold over the newsletter and address the bottom half of the last page and staple. Or five sheets (10 pages) can be sent in a standard size envelope with one stamp. (Warning: The post office is always changing its rates and rules, so keep abreast of the latest with your local post office.)

A club newsletter, first of all, contains club news: the date, time, and place of the next meeting and a description of the program for the meeting. Lists of activities such as foxhunting, Field Day, radio calibrating day, club picnic, a Christmas party, or anything that the club is currently involved in, can be put into the club paper.

Next, include congratulations to the members on upgrading and any personal notes that you can dig up during the month. Then, depending on the amount of space left, you can fill in with amateur-related articles such as: comments on amateur radio news at large, regulations, FCC changes, antennas, etc. Anything and everything that the editor and members can think of can be put in the club newsletter, except politics. The club newspaper is a written account of club activities and members' interests.

Who? is always the 64-thousand-dollar question. Be assured, if you bring up the idea, you will be the first one considered for the job of editor. Experience is useful in any case, but not a real consideration. The real consideration is the willingness to do the job. Some clubs just make it the responsibility of one of the officers, such as a vice-president, for a one-year term. Somehow it's not so bad to know that you only have to do 11 issues. (You get one issue off for summer vacation.)

No matter who is the editor or responsible person for the newsletter, he/she will need the cooperation of the whole club. There is nothing more frustrating for an editor than to be at deadline and not have the necessary information. An editor is not an investigative reporter who has to sift through all the scuttlebutt and info to find the true facts. An editor reports the news as given to him.

Where does all this news come from? *The members!* If someone is a little too modest to report an upgrade such as passing the Extra exam when all he was trying for was his Novice license, then one of his friends should report it. It is up to the members to keep the newsletter interesting. Too many members think, "Oh, they'll hear about it." Or, "That's not important enough." *Anything* concerning the members is of interest in a club newspaper.

It is the responsibility of the editor to correlate all of the various items and to lay out the material on the pages. The editor cannot manufacture news. Since this is a volunteer, non-paying, do-it-in-your-free-time-when-you-could-be-DXing job, the editor does not have the time to search out stories. The more people who contribute to the newsletter, the more of a club newspaper it is, instead of just a one-man show.

One thing I have found: Don't just ask in general for people to contribute information or articles. An editor must impose upon his friends. "I heard about your new antenna, Bill. Would you please write something up on it? Anything at all, Bill, that you want to tell us about your new antenna." You must ask directly on a specific topic. The more people you ask, the better your chances are of getting any copy back in return. Many members are surprised that you are even interested in their projects and are happy to comply with your request. (Maybe not happy, but they grit their teeth and do it.)

An editor's job is to plan. After relevant club news, any other articles or info of interest to amateur radio in general can be included, depending upon the amount of space available. This is why it's so important to have a specific deadline. When the deadline comes, the editor gathers all the information submitted to him during the past month and figures out how much space different articles need and what looks good where.

Don't despair. It's not really hard and the more you do it, the easier it becomes. But let me repeat—there is nothing more frustrating for an editor than to be at deadline and not to have the information needed. A joy of an editor's life is having too much material! Then he can plan what will go into the next issue and be that much ahead of the game.

It's just too easy to let the other guy do it. If a newspaper is to be successful, the members must cooperate. The beauty of it is that the members really don't have to do very much. Each gives a little and the news comes flowing in. Letters to the editor are always interesting. Members can send in their public service reports such as calling in traffic accidents and other related public service info. The local ARES EC can submit material to the editor about

ARES activites or even just give pep talks via the newsletter. But the vehicle of the newsletter must be used or it will die or atrophy. If the members don't care enough to send in the material, after a while the editor will feel that he is wasting his time.

The form in which the material for the newsletter is sent depends upon the individual club. The varying factors are many. Some editors (or a club typist) type up the entire newsletter and send it to the printer. Others give out specifications on, for example, margins and ask that the individuals hand in the material already typed. The editor then pastes up the various articles, using rubber cement. Many editors are just happy to receive the material and ask only that the handwriting be legible!

Keep in mind credit lines. It's wrong just to copy someone else's work word for word and pass it on as your own. If it's copyrighted, then write to the party involved to get permission to reprint. This is very simple to do and most people are glad to give a nonprofit organization cooperation. If your source is another newsletter, just be sure to give a credit line to the author of the article and the newsletter in which you found it. The Golden Rule is certainly applicable in this situation.

One great source of extra information (filler) is the National Aeronautics and Space Administration's publication, *Tech Briefs*. This is a collection of the various research and development projects carried on by NASA. *Tech Briefs* applies space technology to Earth problems. It's an impressive publication, sent out quarterly. There is usually something of interest to hams in the publication. When I wrote for permission to reprint, the reply, from Louis Mogavero, Director, Technology Utilization Office, was:

"NASA *Tech Briefs*, once published, are considered to be in the public domain. They may be reprinted by anyone, without permission from NASA."

If you're interested in receiving a copy, just write to: Director, Technology Utilization Office, PO Box 8757, Baltimore/Washington International Airport MD 21240.

Another good source that gives permission for reprinting is *HR Report*. *HR Report* is an up-to-the-minute newsletter published weekly, reporting happenings in amateur radio across the country. It makes great filler copy. All they ask is that a proper credit line be given. If you're interested in receiving it, write: *HR Report*, Greenville NH 03048.

Worldradio News is an amateur newspaper published monthly concerning radio news in the world. They say, "*Worldradio* is an international conversation. You are invited to take part. Our newspaper is written by its readers.

"Our goal is to be a valuable resource of ideas and experiences beneficial to the amateur radio community. We publicize and support the efforts of those who bring the flame of vitality into this avocation."

Editors of club newspapers may exchange their newsletter for a copy of *Worldradio News*. They also automatically grant permission to reprint. If you're interested, write: Worldradio, Inc., 2120 28th Street, Sacramento CA 95818.

Another interesting untapped source of information is your own collection of amateur radio contacts. Along with my QSL cards to foreign lands, I enclose a note with a copy of the newsletter, asking for stories about amateur radio in their countries or just information on themselves. Everything considered, I've gotten terrific response. I always send them a copy of the newsletter with their story, written in their own words, with their byline. This is a good way for amateurs to create international goodwill. Not only that, it's educational for us to learn about how others in the world operate and live. Communication between people is the only hope for world peace.

How to get your paper printed is a goodie as far as problems go. The best thing is to find a ham who is also a printer, and use your power of persuasion to have him print up the newsletter. If you have the president of a large company like Xerox® in your club, persuade him to volunteer, and you're in like Flynn!

Lee Knirko W9MOL is editor of *QCC News*, the publication of the Chicago Area Chapter of the Quarter Century Wireless Association; also, he was president of the Amateur Radio News Service. Lee suggests:

"There are generally three ways to produce a paper. Offset press, photo process (Xerox or other electrostatic copier), and duplicator. Each has its advantages and disadvantages, including the cost per page. Generally, though, clubs usually use what is available. Particularly when it is free or cheap! Finding a ham printer using offset is the best of all worlds because of the flexibility and low cost per page, particularly if a fairly large quantity is printed, say over 200-300 copies. If fewer than, say, 25 copies are distributed, offset is expensive and one of the other methods is more favorable."

Xerox is a popular process used with club newspapers. Lee says:

"Many, but not all, tricks available to offset reproduction can be done with Xerox. You can reduce (8-1/2" × 11 from 11" × 14" is the most favorable), print two sides, and automatically collate. The quality is not as good as offset, particularly for photos (screening helps), large black areas, or material previously Xeroxed. We now pay about $75 an issue for 250 copies including photos and other graphics at my local ham printer."

Club finances, of course, influence the number of pages and type of printing done for the newsletter. There is only one way to find out the best method for you and your club: trial and error (which also is known as "Research and Development"). As Lee W9MOL says, "Bear in mind that reproduction quality is *not* the most important element in a club paper. If the *content* is there for *your readers*, they won't care how it's reproduced."

One nice thing about editing a club paper is that you get very few complaints. (I wonder why . . .?)

Eeks!! What do I say? You simply report the news in your own words. Everyone has his own style of writing. Keep in mind to have the five Ws—who, what, where, why, and when; you won't go too far wrong. Lee W9MOL has more advice:

"Before starting on an issue, you need to make a list of everything you might put into your paper. Then you need to type the material or get someone else to type it for you. You then pick and choose, expand or contract, to fit space needs. The first sentence is the 'grabber' designed to catch the readers' attention so they'll read on. Get some sample newsletters and study them for help in developing your own style."

Also have a standby dictionary. It's amazing how simple words don't "look" right when you know it's going to be printed hundreds of times. See if you can coerce someone to proofread for you. When you're familiar with the content and

writing, it's very hard to find your own mistakes until after it's printed. Then every error sticks out like a sore thumb.

Another help for editors is the Amateur Radio News Service: a volunteer organization dedicated to helping anyone involved with PR work or newspapers. Once a month, ideas are pooled from editors and PR people from all over the country and are printed in the *Bulletin*. They also have a booklet that is sent to new members entitled *The Club Paper*, which goes into detail as to the mechanical aspects of printing. If you're interested, write to Fran Norrick WB9WPS, Secretary, ARNS, Route 6, Box 239, Kankakee IL 60901.

Be an administrative editor. This is your chance to be an executive! As Lee says, "Consider the administrative editor who persuades his or her club's officers and members to submit good material, finds someone who likes to draw cartoons, recruits some volunteer typists, locates a ham printer, organizes a circulation committee, and oversees to see that they have the finest paper for the club."

The more reporters you can assign, the more columnists you can draft, the more fun your newsletter can be for the club members.

If you know of any ham who is into computers, draft him to do the address labels. Appoint a committee to be responsible for collating (putting the pages in order), stapling, addressing, and mailing. Don't forget the stamps!

Make your next club project your club newsletter. Participation is the key to success. Cooperation is the byword.

Do it! Be it! Say it! Amateur radio news—write it today.■

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MFJ Enterprises, Inc.
BOX 494, MISS. STATE, MS 39762

Glenn Jacobs KC7M
Poverty Flat AZ 85925

My Infernal Tower

—tales of a flying fiasco

Up! The higher the better! My Novice antenna was barely high enough to walk under. The next one wasn't much above the roof. Higher! Tie sawmill scraps together with coathangers. Guy them to the fence and the woodshed with baling wire. Get that droopy dipole up there!

Good enough? No. Crooked as a dog's leg, and ugly besides. And with all the effort, it isn't as high as the electric wires to the east. And there is still 200 feet of rock to the west. Signals coming in all the way from Hawaii are not tough enough to penetrate much rock. Maybe there isn't such a thing as "good enough." Maybe "good enough" is just an illusion.

A man came to my store and traded a nice TV antenna and mast for some used duffel bags. Before the sun went down, that hardware was all standing on end. TV reception was better, even if the programs weren't. The FM station from fifty miles over the mountains came in perfectly. We could listen to beautiful music. And I had a taller skyhook. That was the real motive.

W7KJM lent me an inverted vee and an NCX-3. I tied a dead padlock to a length of nylon line and slung it over the TV antenna and hauled up that loaner. Aha! Forty meters is mine!

But even the top of the thing is lower than the high-lines. *Nothing* would do but a tower. But towers seem to start at a month's wages. And they have no upper limit. Besides, it seemed sinful to spend anything on a *hobby* as long as I still owed on the homestead mortgage. ("Mort" is Latin for "dead." "Gage" is Latin for "pay-'til-you-are.")

The Final Solution

Anyway, one fine day we made a last back-breaking payment and the mortgage company sent us our title. And a few days after that an ad appeared:

> COLOR TV $75. Waterbed $100. 30' aluminum twoer [sic] $90. Trash-trailer $250. 537-XXXX

Now, a "twoer" thirty feet long might be a boat—but not for $90. Then, again, it might be a tower. It was a long-distance call, but I dialed during daylight.

"Popopopopop. Popopop. Popopopopopo pop," etc. "B-r-r-r-r-r-r-r-r. B-r-r-r-r-r-r-r-r," etc.

"Raunchy Realty. Betty speaking. May I help you?"

"You advertised a tower for ninety dollars?"

"Yes, sir. Would you like to look at it?"

"Yes, ma'am. Could you tell me . . .?"

"Yes, sir. We'll have it all cleaned out and the lights on by tomorrow noon."

"Lights?"

"Naturally."

"On a thirty-foot tower?"

"Tower?"

"Yes, ma'am. Tower. Maybe I have a wrong number. Excuse me."

I hung up and dialed again.

"Raunchy Realty. Betty speaking."

"Uh, this is me again. Is somebody in the office selling a tower?"

"Wait. I don't know. Uh, I thought you wanted to rent that garage for ninety dollars. Fred. Ff-rr-ee-dd! Somebody wants a tower."

"Tower? Oh, yeah," I heard in the background, along with a typewriter. "George has one he wants to get rid of. It's that pile of scrap iron in the alley."

It was fifty miles away. We were there very shortly. George was not there but his tower was. It looked so pitiful lying in three pieces by the garbage cans. It didn't look like it would even reach the eaves, much less the high-lines. I picked up a section in each hand. It was not aluminum, but steel. Even so, it didn't weigh much. I had really expected something much, much heavier. On the other hand, the sections seemed stiff enough, braced that way.

Well, this was what I came for. George showed up and I paid him with money I had borrowed on my credit card. We went home, and the thing laid out behind the house for an unconscionably long time.

The most obvious thing to do was to dig a big hole next to the peak of the roof, stand the bottom section in it, and fill the excavation with wet cement. I could bolt on the other sections after the concrete cured and brace it to the house.

No. That was the only direction we could ever hope to build onto our house.

By-n-by, I traded a fairly good swivel chair (that only needed a little welding and only had a small rip in the cushion) for three unequal lengths of nearly straight one-inch pipe with only a little surface rust. They would not fit into the tower legs. After two hours of hard filing, they were still a smidgen too big. I took them to the welder. He told me what it would cost to turn them down on his lathe. Too much. Inspiration struck. I took the pipes to the hardware store. For a buck, the nice man threaded the first four inches on each one. That reduced the diameter a little and they fit into the tower legs just fine.

I dug a hole and calculated the amount of concrete to fill it up. Fifty bucks?! No way!

I bought ten bucks worth of instant-mix concrete and gathered about a ton of rocks. I joined the pipes to the bottom of a tower section and stood it up in the bottom of the hole and plumbed it with a carpenter's level. The carpenter was using some other tool at the time and didn't mind a bit.

By choosing the rocks carefully, there was not a lot of space between them. A layer of rocks and a pour of soupy cement poked down with a stick; another layer of chunks and more liquid stone. The pre-mix and the stones and the hole came out remarkably even. I smoothed it off immediately and again an hour later. At sundown, I carved a date in it and covered it with dirt so it wouldn't dry out before it had a chance to cure. (Contrary to common belief, concrete does not harden by drying out. It actually combines with the water and becomes a different sort of substance.)

There stood my stub of a tower for a long time. It began to look like the situation described in Luke 14:28-30. I climbed up, balancing the second section on end, and tried to fit it on top of the first. Maybe it can be done. Maybe a suicidal maniac will accomplish such a thing, someday. I won't try it again. Ever.

Success By Committee

W7KJM promised me a crew for an antenna-raising party if I would put the whole thing together. So, I got all the bolts, insulators, guy wire, and turnbuckles I thought I needed. I set the guy anchor posts deep in the ground and tamped buckets of rocks around them. I took that lonesome section off its makeshift base and put the whole tower together and attached the guys.

Exactly at the appointed hour, Ed, Ray, Paddy, Bob, Randy, and Dick drove up in a convoy.

One minute later they were all driving away again. The tower was up and guyed. They barely stopped for the sandwiches and Kool-Aid my wife brought out to the "party." They wouldn't accept pay or thanks.

"That's what ham buddies are for, Glenn."

That was quite a while back. I admire the tower every day. (What else is it good for? I don't have an antenna to put on it.) I climb it sometimes for the superb view from the top. I made a brace for the base because those three pipes go eye-high out of the ground before the tower even begins.

Today I bought nine feet of 1¼-inch pipe for a mast. It was a foot too long to go into the tower from the side. No way was I going to carry it up to the top and try to stuff it into the socket from above. At the price I paid, I sure didn't want to saw off a foot of it. Finally, I dug a hole in the ground and shoved the mast into the tower *from below ground*.

It is night. As I write this, my tower and mast rise way above the electric wires. Maybe I will have an antenna soon. There's this guy down in Phoenix with a 20m beam for sale. If he'll just wait until the garage-man finishes putting a new motor in my pickup, I'll borrow some money on my credit card again and go buy it. It's only a five-hundred-mile round trip, and I want to take my children to visit their grandparents, anyway. ■

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Reader Service—see page 82

Apples: Five Bits or Eight

— tired of "Space Invaders"? Then turn your Apple II on to RTTY!

Carl Jensen WB6MEP
9842 Palais Road
Anaheim CA 92804

If you have run out of things to do with your Apple II lately, you might like to try this project. It will get you operating on 5-bit RTTY and, with a little rewiring, 8-bit ASCII also. For 8-bit ASCII, you will have to rewrite the program. The Apple II interface in Fig. 1 is built around the COM 2502 UART. The AY5-1013 is an exact replacement and may be used. The system can be used with any SSB or FM transceiver.

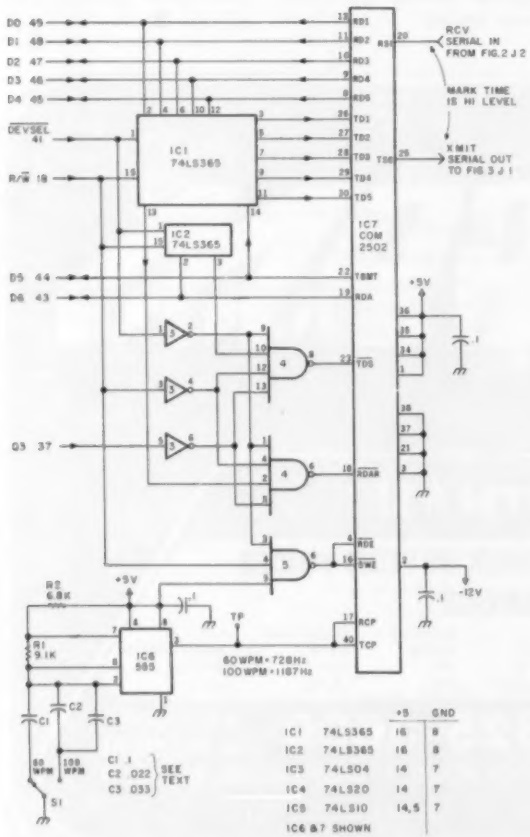


Fig. 1. Apple II interface.

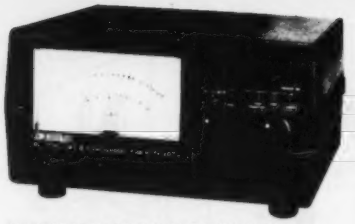
How It Works

See Fig. 1. During receive, the UART accepts serial data at pin 20, RSI. When one complete character has been received, it is available in parallel form at RD1 through RD5. We know this character is ready when RDA goes high. RDA is tied to the Apple's data-bus bit 6 which we test in the program. The character is processed and printed on your TV monitor. Next, the Apple sends $\overline{\text{RDAR}}$ on bit 5, which resets RDA to low so that we can tell when the next character comes in.

During transmit, the UART tells us it is ready to transmit the next character by bringing TBMT high. TBMT is tied to data-bus bit 5. When the Apple detects bit 5 high, it puts the next character to be transmitted on data-bus bits 0 through 4 and sets bit 6 high also. Bit 6 high is $\overline{\text{TDS}}$ and enters the character into the UART at TD1 through TD5. The UART then clocks the character out serially at TSO. One start bit and two stop bits are added by the UART.

Enabling $\overline{\text{RDE}}$ and $\overline{\text{SWE}}$ puts the received data and status bits on the data bus. When not enabled, these outputs are at a high impedance and will not disturb Apple operation. IC6 is the 16× clock generator. Provision is made for either 60- or 100-wpm operation.

Fig. 2 is the demodulator. Receiver audio is fed into J1 from your receiver headphone jack. The speaker is handy for listening to incoming signals. The audio bandpass filter is not necessary but can help with QRM and QRN. Also, the output of the filter can be fed to a scope for use as a tuning indicator of sorts. More on this later. I used an Autek filter. You can use any kind of filter you wish, or none at all. During FSK, when the demodulator senses a 2295-Hz tone, it puts out a high level at J2. When a 2125-Hz



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Accuracy:	±10%
Power Requirements:	117 VAC 60 Hz

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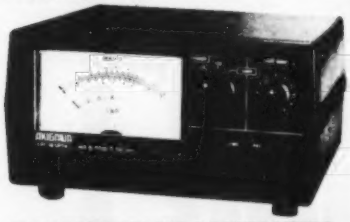
Power Range:	0 – 200, 1000, 2000W
SWR Range:	1:1 – 3:1
Accuracy:	±10%
Power Requirements:	None



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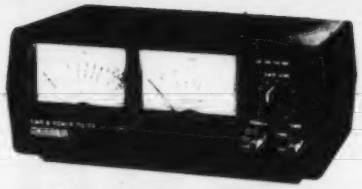
Input Impedance:	50 – 52 ohms
Power Range:	0 – 20, 200W
SWR Range:	1:1 – 3:1
Accuracy:	±10%
Power Requirements:	None



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MODEL PM-3HV $54.95

Frequency Coverage:	3 – 150 MHz
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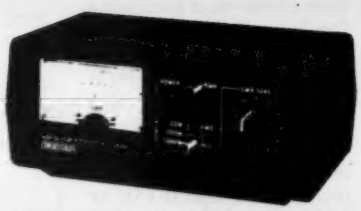

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Power Range:	0 – 20, 200, 1000W
SWR Range:	1:1 – 3:1
Accuracy:	±10%
Power Requirements:	None

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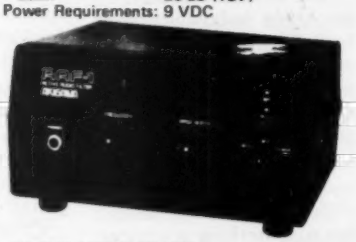

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RF Attenuation:	–20 dB & –10 dB
Input/Output Impedance:	50 – 75 ohms
Relay Power Capability:	200W CW
Power Requirements:	117 VAC 60 Hz

(Prices are suggested list and are subject to change without notice.)

✔Reader Service—see page 82

tone comes in, it puts out a low level. In FSK (10 meters and below), 2295 Hz is used as the mark time; 2125 Hz is used as the space. This gives a downward shift of 170 Hz. In AFSK (6 meters and above), the tones are reversed. S1 selects FSK or AFSK and will be labeled during alignment.

Fig. 3 is the modulator. The input at J1 is from the serial output of the UART. For a high input, we get a 2295-Hz tone at J2. A low input gives us 2125 Hz out. The output of the XR210 is made into a sine wave by the low-pass filter so that our transmit signal will not be too wide. The filter cutoff is about 3 kHz. S1 allows you to identify in CW. S2 is wired in at the mike jack the same way as a PTT switch. S3 selects FSK or AFSK.

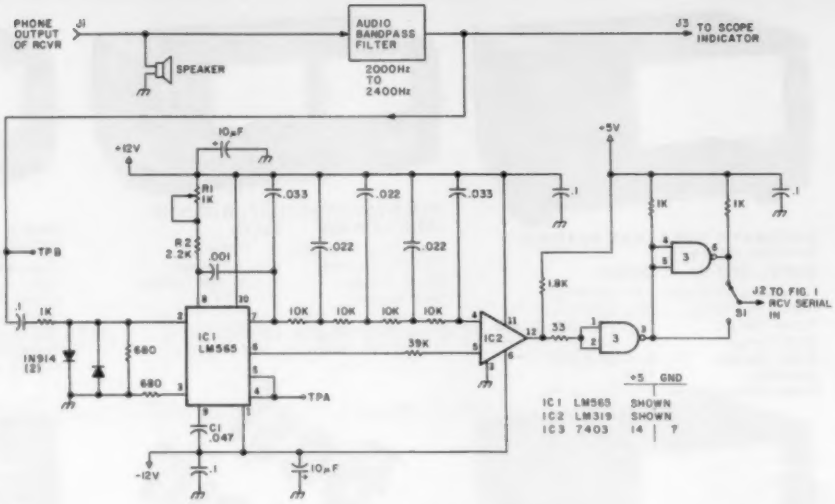

Fig. 2. Demodulator schematic diagram.

Construction

The interface is built on an Apple hobby/prototype board, Apple part number A2B0001X. This board is made to plug into the I/O slots at the back of the Apple. S1 is brought out in back of the Apple so that you can get at it. No layout is included with this project because nothing is critical. You should have no trouble if good general construction practice is used. Capacitors C1, C2, and C3 must be of good quality, like mylar™ or polystyrene. It is a good idea to construct the IC6 circuit on an experimental basis first and trim C1, C2, and C3 to get the clock frequency within 1%. A frequency counter is the only good way to do this. At 60 wpm, the frequency at IC6, pin 3, should be 728 Hz plus or minus 7 Hz. At 100 wpm, it will be 1187 Hz plus or minus 10 Hz. This trimming can be done with small value mica or ceramic capacitors. After you have built the circuit on the Apple board, check the clocks again. They may need a little more trimming.

My SSB phone-jack output is 8 Ohms, so a speaker at J1 works fine (see Fig. 2). If yours has a higher impedance, you may need a transformer to match to the speaker. The power supply for Figs. 2 and 3 is separate from the Apple. If you wish, you could use power from the Apple for these circuits also. C1 should be a good quality capacitor. S1 is brought out to the front panel.

C1 in the modulator (Fig. 3) should be of good quality. S1, S2, and S3 are brought out to the front panel. The chokes are the common 88-mH variety or equivalent. In all circuits, resistors are quarter- or half-Watt 5%. All capacitors not mentioned may be of any type.

Alignment

First do the modulator. With S1 in normal, hook the scope to J2 and make sure you have an audio sine wave. Adjust R3 for about 1 volt or enough to run your frequency counter. Now hook the frequency counter to J2. Put S3 to FSK and short J1 to ground. Adjust R2 for 2125 Hz. If you can't get 2125 Hz, adjust both R1 and R2 for 2125 Hz. Put S3 to AFSK and adjust R1 for 2295 Hz. These controls are interacting, so go back and forth several times until you have the correct tones. The tones are very stable and will stay within 1% drift easily. Now verify the conditions listed in Table 1.

The output at J2 should be a nice-looking sine wave.

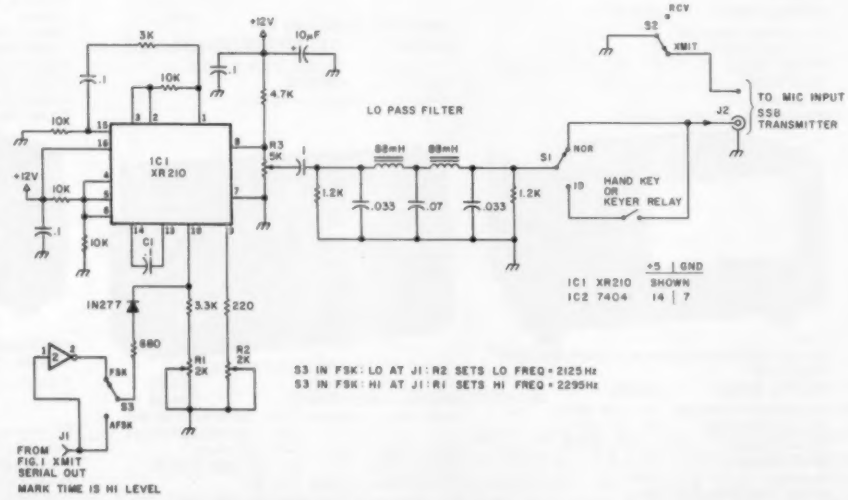

Fig. 3. Modulator. Output in FSK: mark time = 2295 Hz; space = 2125 Hz. Output in AFSK (tones are reversed): mark time = 2125 Hz; space = 2295 Hz.

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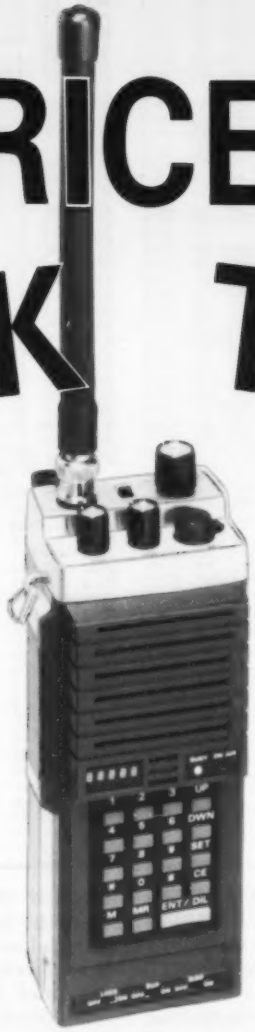

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Program listing.

```
Data Table
ØØØØ  AØ  Blank
ØØØ1  C5  E
ØØØ2  8A  Line Feed
ØØØ3  C1  A
ØØØ4  AØ  Space
ØØØ5  D3  S
ØØØ6  C9  I
ØØØ7  D5  U
ØØØ8  8D  Carriage Return
ØØØ9  C4  D
ØØØA  D2  R
ØØØB  CA  J
ØØØC  CE  N
ØØØD  C6  F
ØØØE  C3  C
ØØØF  CB  K
Ø81Ø  DØ  T
Ø811  DA  Z
Ø812  CC  L
Ø813  D7  W
Ø814  C8  H
Ø815  D9  Y
Ø816  DØ  P
Ø817  D1  Q
Ø818  CF  O
Ø819  C2  B
Ø81A  C7  G
Ø81B  AA  *
Ø81C  CD  M
Ø81D  D8  X
Ø81E  D6  V
Ø81F  AA  *
Ø82Ø  AØ  Blank
Ø821  B3  3
Ø822  8A  Line Feed
Ø823  AD  -
Ø824  AØ  Space
Ø825  87  Bell
Ø826  B8  8
Ø827  B7  7
Ø828  8D  Carriage Return
Ø829  A4  $
Ø82A  B4  4
Ø82B  A7  '
Ø82C  AC  ,
Ø82D  A1  !
Ø82E  BA  :
Ø82F  A8  (
Ø83Ø  B5  5
Ø831  A2  "
Ø832  A9  )
Ø833  B2  2
Ø834  A3  #
Ø835  B6  6
Ø836  BØ  Ø
Ø837  B1  1
Ø838  B9  9
Ø839  BF  ?
Ø83A  A6  &
Ø83B  AA  *
Ø83C  AE  .
Ø83D  AF  /
Ø83E  BB  ;
Ø83F  AA  *
Ø88Ø  AA  *
Ø881  AA  *
Ø882  AA  *
Ø883  AA  *
Ø884  AA  *
Ø885  AA  *
Ø886  AA  *
Ø887  C5  Bell  (CTRL G)
Ø888  42  Line Feed
Ø889  AA  *
Ø88A  AA  *
Ø88B  AA  *
Ø88C  AA  *
Ø88D  48  Carriage Return
Ø88E  AA  *
Ø88F  AA  *
Ø89Ø  AA  *
Ø891  AA  *
Ø892  AA  *
Ø893  AA  *
Ø894  AA  *
Ø895  AA  *
Ø896  AA  *
Ø897  AA  *
Ø898  AA  *
Ø899  AA  *
Ø89A  AA  *
Ø89B  AA  *
Ø89C  AA  *
Ø89D  AA  *
Ø89E  AA  *
Ø89F  AA  *
Ø8AØ  44  Space
Ø8A1  CD  !
Ø8A2  D1  "
Ø8A3  D4  #
Ø8A4  C9  $
Ø8A5  AA  *
Ø8A6  DA  &
Ø8A7  CB  '
Ø8A8  CF  (
Ø8A9  D2  )
Ø8AA  AA  *
Ø8AB  AA  *
Ø8AC  CC  ,
Ø8AD  C3  -
Ø8AE  DC  .
Ø8AF  DD  /
Ø8BØ  D6  Ø
Ø8B1  D7  1
Ø8B2  D3  2
Ø8B3  C1  3
Ø8B4  CA  4
Ø8B5  DØ  5
Ø8B6  D5  6
Ø8B7  C7  7
Ø8B8  C6  8
Ø8B9  D8  9
Ø8BA  CE  :
Ø8BB  DE  ;
Ø8BC  AA  *
Ø8BD  AA  *
Ø8BE  AA  *
Ø8BF  D9  ?
Ø8CØ  AA  *
Ø8C1  43  A
Ø8C2  59  B
Ø8C3  4E  C
Ø8C4  49  .
Ø8C5  41  E
Ø8C6  4D  F
Ø8C7  5A  G
Ø8C8  54  H
Ø8C9  46  I
Ø8CA  4B  J
Ø8CB  4F  K
Ø8CC  52  L
Ø8CD  5C  M
Ø8CE  4C  N
Ø8CF  58  O
Ø8DØ  56  P
Ø8D1  57  Q
Ø8D2  4A  R
Ø8D3  45  S
Ø8D4  5Ø  T
Ø8D5  47  U
Ø8D6  5E  V
Ø8D7  53  W
Ø8D8  5D  X
Ø8D9  55  Y
Ø8DA  51  Z
Ø8DB  AA  *
Ø8DC  AA  *
Ø8DD  AA  *
Ø8DE  AA  *
Ø8DF  AA  *
Ø8EØ  No Data.  This address is
      for Figs/Ltrs flag.
Ø8E1  No data.  This address is
      for character counter.
Ø8E2  92  CTRL R
Ø8E3  94  CTRL T
Ø8E4  83  CTRL C
Ø8E5  81  CTRL A
Ø8E6  82  CTRL B
Ø8E7  88  Line Feed
Ø8E8  DF
Ø8E9  4C D5 Ø9  JMP To RCV
Ø8EC  4C 2C ØA  JMP To send CQ
Ø8EF  3 Addresses.  User define.
Ø8F2  3 Addresses.  User define.
Ø8F5  5F  Letters Tmit
Ø8F6  5B  Figures Tmit
Ø8F7  1F  Letters Rcv
Ø8F8  1B  Figures Rcv

Tmit
Ø9ØØ  A9  F5      LDA  Ltrs to A
Ø9Ø2  2Ø  B4  Ø9  JSR  Send Ltrs
Ø9Ø5  A9  ØØ      LDA
Ø9Ø7  8D  EØ  Ø8  STA  Set flag to Ltrs
Ø9ØA  8D  E1  Ø8  STA  Set character counter to ØØ
Ø9ØD  2C  ØØ  CØ  BIT  Is key down?
Ø91Ø  1Ø  FB      BPL  Loop if not
Ø912  AD  ØØ  CØ  LDA  Get key code
Ø915  2C  1Ø  CØ  BIT  Clear keyboard
Ø918  CD  E2  Ø8  CMP  Is it CTRL R?
Ø91B  FØ  CC      BEQ  Yes so go to Ø8E9
Ø91D  CD  E4  Ø8  CMP  Is it CTRL C?
Ø92Ø  FØ  CA      BEQ  Yes so go to Ø8EC
Ø922  CD  E5  Ø8  CMP  Is it CTRL A?
Ø925  FØ  C8      BEQ  Yes so go to Ø8EF
Ø927  CD  E6  Ø8  CMP  Is it CTRL B?
Ø92A  FØ  C6      BEQ  Yes so go to Ø8F2
Ø92C  CD  E7  Ø8  CMP  Is it a linefeed?
Ø92F  DØ  ØB      BNE  Not a linefeed so go to Ø93C
Ø931  2Ø  B4  Ø9  JSR  Send linefeed
Ø934  A9  8A      LDA
Ø936  2Ø  ED  FD  JSR  Print linefeed
Ø939  4C  ØD  Ø9  JMP  Do again
Ø93C  CD  Ø4  Ø8  CMP  Is it a space?
```

If not, the low-pass filter is not working correctly. Both tones at J2 should be the same amplitude within plus or minus 10%.

Now align the demodulator. With no input at J1, hook the frequency counter to test point A at IC1, pin 4. You should be able to adjust R1 to 2200 Hz. If not, something is wrong with R1, R2, or C1. For the next alignment, we are going to use the modulator. Also, you will need a TTL symmetrical square-wave generator at about 50 Hz. The circuit of Fig. 4 gives you some tips on how to make one. Hook the output of your TTL symmetrical square-wave generator to the modulator, J1. Modulator S3 can be in either position. Modulator S1 should be in normal. Open the circuit at demodulator TP B and connect modulator J2 to the input of IC1 at TP B. Now hook the scope to demodulator J2. You should get a square wave. The crossover points will be jittery. This is normal. Now adjust demodulator R1 for a symmetrical square wave. Exactly half the square wave should be low and the other half should be high. Make sure of the following conditions: Ground modulator J1. With modulator S3 in FSK, you should have a low level at demodulator J2. If not, flip demodulator S1 to the other position. Label this position FSK. Label the opposite position AFSK. Now, with demodulator S1 in FSK, connect +5 V to modulator J1. You should get a high level at demodulator J2.

Now let's check out your SSB transceiver. For starters, the output of modulator J2 should be about 50 mV. Set R3 for this value. If this is not enough to drive your transmitter, then increase the level as needed. Connect modulator J2 to the mike input. Put modulator S3 to FSK, S1 to normal, +5 V to J1, transceiver mode to SSB, and mike gain off. Throw modulator S2 to XMIT; advance mike gain.

Caution! Use only enough mike gain to run your transmitter at about 40% to 50% of its rated dc plate input power on CW.

Next, you must make sure your transceiver is in USB so that the frequency shift will be downward. A good way to do this is to check transmitter frequency with your counter or listen to it on another receiver tuned to USB.

S3 to FSK	J1 grounded	output is 2125 Hz	space
S3 to FSK	J1 to +5 V	output is 2295 Hz	mark
S3 to AFSK	J1 to +5 V	output is 2125 Hz	mark
S3 to AFSK	J1 grounded	output is 2295 Hz	space

Table 1.

Example in FSK and USB

Your vfo equals 3620000 Hz + 2295 Hz = 3622295 Hz. This is the mark time frequency. Now connect modulator J1 to ground. Vfo equals 3620000 Hz + 2125 Hz = 3622125 Hz. This is the space frequency. Your transmitter shifted 170 Hz lower.

```
093F  D0 19     BNE  Not a space so go to 095A
0941  20 ED FD  JSR  Print
0944  20 B4 09  JSR  Send
0947  EE E1 08  INC  Add 1 to character counter
094A  A9 43     LDA
094C  CD E1 08  CMP  Is character counter = to 67?
094F  F0 03     BEQ  Yes so go to 0954
0951  4C 0D 09  JMP  Counter not 67 yet so do again
0954  20 3A FF  JSR  Ring bell
0957  4C 0D 09  JMP  Do again
095A  CD 8D 00  CMP  Is it carriage return?
095D  D0 0B     BNE  Not a carriage return so go to 096A
095F  20 ED FD  JSR  Print carriage return
0962  20 B4 09  JSR  Send
0965  A9 0D     LDA
0967  20 0A 09  JMP  Do again
096A  AA        TAX  A to X
096B  BD 00 08  LDA  Get RTTY character
096E  CD 1B 00  CMP  Is it = to AA?
0971  D0 03     BNE  Not AA so go to 0976
0973  4C 36 09  JMP  It is AA so print
0976  2D E8 00  AND  Is it a letter?
0979  30 17     BMI  Not a letter so go to 0992
097B  2C E0 08  BIT  Is flag = to letters?
097E  30 04     BMI  Flag not = to letters so go to 0984
0980  8A        TXA  Flag is = to letters so
0981  4C 41 09  JMP  Print and send
0984  A9 00     LDA
0986  8D E0 08  STA  Set flag to letters
0989  A9 F5     LDA  Address of letters to A
098B  20 B4 09  JSR  Send
098E  8A        TXA  Get character back
098F  4C 41 09  JMP  Print and send
0992  2C E0 08  BIT  It is a figure so is flag = to figures?
0995  10 04     BPL  Flag not = to figures so go to 099B
0997  8A        TXA  Flag is = to figures so
0998  4C 41 09  JMP  Print and send
099B  A9 80     LDA  It is a figure so
099D  8D E0 08  STA  Set flag to figures
09A0  A9 F6     LDA  Address of figures to A
09A2  20 B4 09  JSR  Send figures
09A5  4C 8E 09  JMP  Send character

Send subroutine
09B4  A8        TAY  A to Y
09B5  AD B0 C0  LDA  Get UART status
09B8  29 20     AND  Is TBMT up?
09BA  F0 F9     BEQ  No do again
09BC  B9 00 08  LDA  RTTY character to A
09BF  8D B0 C0  STA  Send
09C2  60        RTS  Do again

Rcv
09C6  4C 00 09  JMP  Go to Tmit
09C9  4C 2C 0A  JMP  Go to send CQ
09CC  3 Addresses.  User define.
09CF  3 Addresses.  User define.

09D5  A9 00     LDA
09D7  8D E0 08  STA  Set flag to letters

09DA  A9 20     LDA
09DC  8D B0 C0  STA  Reset RDA
09DF  2C 00 C0  BIT  Is key down?
09E2  10 1A     BPL  If not go to 09FE
09E4  AD 00 C0  LDA  Get key code
09E7  2C 10 C0  BIT  Clear keyboard
09EA  CD E3 08  CMP  Is it CTRL T?
09ED  F0 D7     BEQ  Yes so go to 09C6
09EF  CD E4 08  CMP  Is it CTRL C?
09F2  F0 D5     BEQ  Yes so go to 09C9
09F4  CD E5 08  CMP  Is it CTRL A?
09F7  F0 D3     BEQ  Yes so go to 09CC
09F9  CD E6 08  CMP  Is it CTRL B?
09FC  F0 D1     BEQ  Yes so go to 09CF
09FE  AD B0 C0  LDA  Get UART status
0A01  AA        TAX
0A02  29 40     AND  Is RDA up?
0A04  F0 D9     BEQ  No so go to 09DF
0A06  8A        TXA  RDA is up so
0A07  29 1F     AND  Get rid of control bits
0A09  CD F8 08  CMP  Is it figures?
0A0C  D0 08     BNE  It is not figures so go to 0A16
0A0E  A9 20     LDA  Set flag to figures
0A10  8D E0 08  STA
0A13  4C DA 09  JMP  Do again
0A16  CD F7 08  CMP  Is it letters?
0A19  D0 03     BNE  It is not letters so go to 0A1E
0A1B  4C D5 09  JMP  Do again
0A1E  0D E0 08  ORA  Get the address
0A21  AA        TAX
0A22  BD 00 08  LDA  Get the character
0A25  20 ED FD  JSR  Print
0A28  4C DA 09  JMP  Do again

Send CQ
0A2C  A2 40     LDX  Start address
0A2E  BD 00 0A  LDA  Get character from table
0A31  C9 AA     CMP  Is it end of table?
0A33  F0 07     BEQ  Yes so go to 0A3C
0A35  20 B4 09  JSR  Send
0A38  E8        INX
0A39  4C 2E 0A  JMP  Do again
0A3C  4C D5 09  JMP  To Rcv

CQ character table
0A40  F5 F5 C4 C5 A0 D7 C2 F6 B6
0A49  F5 CD C5 D0 A0 A0 C3 D1 A0
0A52  C3 D1 A0 C3 D1 A0 C3 D1 A0
0A5B  C3 D1 A0 C3 D1 A0 C4 C5 A0
0A64  D7 C2 F6 B6 F5 CD C5 D0 A0
0A6D  A0 C3 D1 A0 C3 D1 A0 C3 D1
0A76  A0 C3 D1 A0 C3 D1 A0 C3 D1
0A7F  A0 C4 C5 8D 88 D7 C2 F6 B6
0A88  F5 CD C5 D0 A0 A0 C3 D1 A0
0A91  C3 D1 A0 C3 D1 A0 C3 D1 A0
0A9A  C3 D1 A0 C3 D1 A0 C4 C5 A0
0AA3  D7 C2 F6 B6 F5 CD C5 D0 A0
0AAC  A0 D7 C2 F6 B6 F5 CD C5 D0
0AB5  A0 CB CB AA
```

Operation

For the program to work as is, you must put the Apple II interface into slot number 3. Operating in transmit is easy. The return key transmits a carriage return. The left arrow key transmits a line feed. Any characters you type on the Apple keyboard that are not compatible with RTTY will print a * and nothing will be sent. You do not have to worry about letters and figures keys. The Apple automatically sends these.

On a standard RTTY printer, 72 characters may be typed before you must type line feed and carriage return. This is hard to keep track of in your head, so the Apple keeps track of how many characters you have typed after the last carriage return, and when the total is 67, the bell rings to let you know you are near the end of a line.

If you are in transmit, you type CTRL R to get to receive. If you are in receive, you type CTRL T to get to transmit. If you want to call CQ, you type CTRL C. Provision is made for special messages or character handling. CTRL A and B are provided in the program for these. Entering the program at $0900 starts you at transmit.

In receive, tune your receiver until you get good copy on the TV screen. The tones will sound high-pitched when you get good copy; with a little practice you can tune this way, but a tuning indicator is better. If you used a low-pass filter in the demodulator, you can hook a scope to J3 and tune by maximum signal on the scope. This will get you very close. The idea is to tune your receiver until the received-signal mark frequency produces a tone of 2295 Hz from your receiver. Then the space tone will be 2125 Hz, if the other fellow is using a shift of 170 Hz—which is the case about 99% of the time.

If you are going to operate on 6 or 2 meters, put all switches in AFSK. AFSK on FM is easier because there is no tuning to do if you are using a synthesized or crystal rig.

When you are trying to tune in a signal, there may be times when you just can't get good print even if the signal is strong. If this happens, try flipping demodulator S1 to the other position. The other fellow may be transmitting upside down.

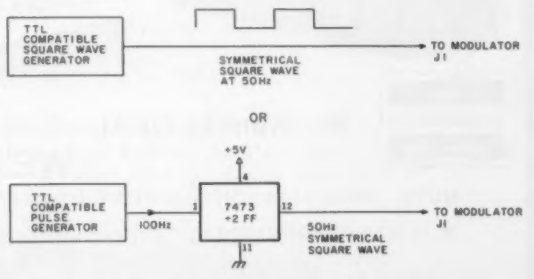

Fig. 4. Square-wave generator.

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About the Program

Addresses $0800 through $083F are the characters which will be printed during receive. $0880 through $08F6 are the characters to be transmitted. You can start the program at $0900. In the CQ program data table, starting at $0A40 you use the address of the character you want to send. You get the addresses from the table located at $0880 through $08F6. For example, my call (WB6MEP) is in the program. You must change it to your call. Starting at address 0A40, the following is transmitted during CQ:

0A40	F5	letters
0A41	F5	letters
0A42	C4	D
0A43	C5	E
0A44	A0	Space
0A45	D7	W
0A46	C2	B
0A47	F6	figures
0A48	B6	6
0A49	F5	letters
0A4A	CD	M
0A4B	C5	E
0A4C	D0	P
0A4D	A0	Space
0A4E	A0	Space

Etc.

Only address low is used. The high order (08) is left out.

Any addresses not listed are "don't care," and you may use them for expansion. If you want to use CTRL A or B for special messages or character handling, you must load the starting addresses of your program at $08EF for CTRL A and 08F2 for CTRL B if you are in transmit. The same starting addresses will be at 09CC for CTRL A and 09CF for CTRL B when in receive. ■

References

1. *RTTY Handbook*, Tab Books, No. 597, Edited by Wayne Green.
2. *Specialized Communications Techniques*, ARRL.

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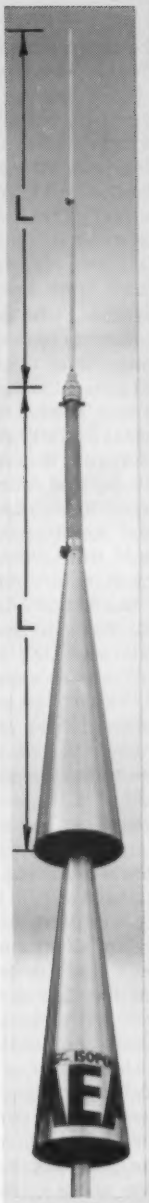

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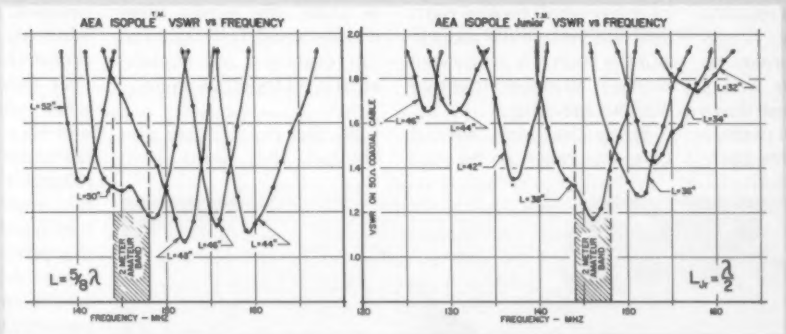

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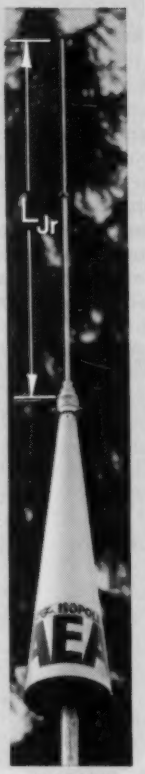

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Rotator Rescue Mission

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It was not too long after installing the new antenna and the Ham II rotator that it happened: The tribander and two-meter beams were at top rotation speed when my finger slipped off the brake release lever. There was a loud noise that came down the tower, rippled with a chill up and down my backbone, and finally settled in my hip (wallet) pocket. Maybe omitting those torsion bars on the guy wires was a mistake. I had visions of many small broken parts scattered inside the rotator. But the Ham II is pretty well made; it all stayed together without breaking.

Since that day, special care was taken to be sure that the antenna was at a complete stop before releasing the brake lever. Then in the heat of trying to catch that six-meter station in Utah, the wrong lever was released first, again at top rotation speed. Luckily, all stayed together again.

At this point it became obvious that some ham might come along who did not know how to operate this equipment and could cause substantial damage! Protection was needed to prevent release of the brake while the antenna was rotating. If a relay was added that released the brake when either rotate lever was depressed, this same relay could be made to delay release of the brake until the antenna had stopped turning. This approach to the problem was incorporated in a Ham II rotator and is presented here for those who would like to do the same. Note that single-lever (instead of two) operation is achieved with this arrangement.

Photo A. Added relay with components on perfboard cemented to case.

This addition to the Ham II is a very simple circuit. It uses easy-to-find parts and readily accepts substitutes from your junk box. Normal operation of the rotator is not affected; you can still use the brake and rotate levers as the factory intended. On gusty, windy days, it is convenient to use the manual brake release until the antenna has stopped being blown about. Wait for the direction indicator to show a lull, and then release the brake lever. The brake release time delay can be adjusted to suit your particular antenna installa-

tion. A two-color LED can be used to show when the brake is engaged or released, but can be omitted if you want a "no holes" installation. I understand that the Ham III rotator circuit is the same as the Ham II, so this addition should operate that rotator as well.

The Circuit

The circuit uses two microswitches above the rotate-control levers to supply power to the brake-release relay and to a capacitor for the time-delay function. The schematic is shown in Fig. 1. When either of the two microswitches is closed (by depressing a rotation-control lever), power is supplied through the resistor string to the base of the transistor, turning on the relay.

One set of the relay contacts is wired across the existing brake release microswitch. Thus, the brake is released any time a rotation control lever is depressed. Note that closing either one of the two new microswitches also charges the 47-uF capacitor through the 100-Ohm resistor. The resistor limits the charge rate and prevents the direction indicator from changing due to the otherwise sudden heavy current draw

When the microswitch is opened (the rotation control lever is released), the capacitor discharges through the resistor string and base of the transistor, keeping the relay energized until the capacitor discharges. This delay allows the antenna to come to a stop before the brake is reengaged. The delay time is set by adjusting the 100k pot. A diode across the relay coil suppresses high voltage spikes generated by the relay's inductive kick.

Ac voltage is applied between points A and C. The two diodes across the second set of relay contacts provide positive or negative voltage (depending on the relay position) through the 1k resistor to the two-color LED. The LED is green when the brake is engaged and is red when disengaged. Power for the circuit is taken from the Ham II direction indicator (meter) circuit. Portions of that circuit are shown in Fig. 1 for reference.

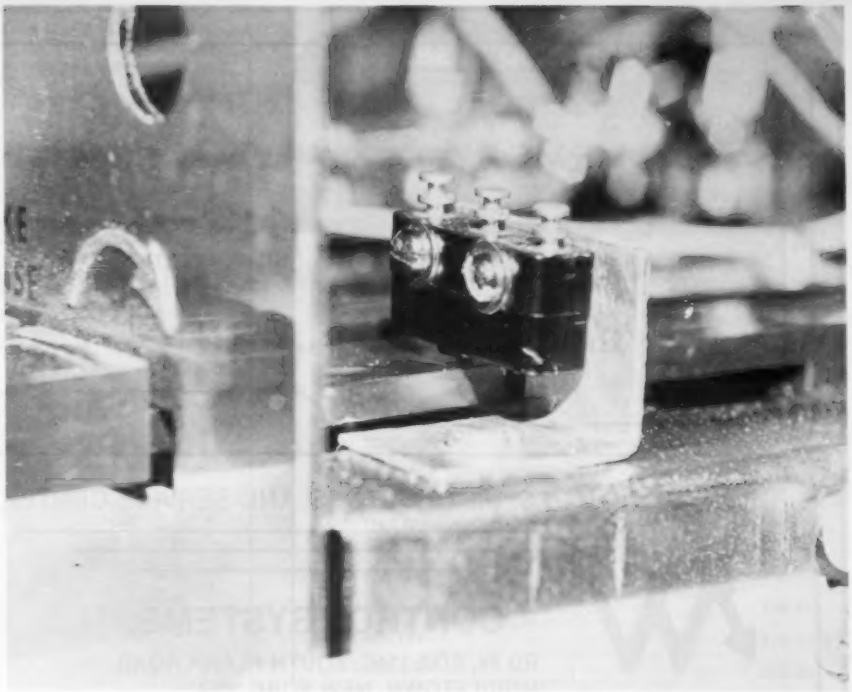

Photo B. Details of microswitch mounting.

Construction

Perfboard is the easiest way to build the circuit because of its simplicity. Point-to-point wiring using component leads is recommended. Fig 2 shows a suggested parts arrangement. The diode for inductive kick suppression is mounted directly on the relay solder lugs. The two diodes and 1k resistor for the two-color LED also are mounted on the relay lugs.

The perfboard should be wired and checked out first; then connect the relay, being sure to observe the correct polarity on the suppressor diode, and substitute a clip lead for the microswitch to test the unit. The relay should close when the clip-lead "switch" is closed and should stay closed for several seconds after the "switch" is opened. The time required for your antenna to stop should be measured and the 100k pot adjusted for that time plus about 1 or 2 seconds more.

My antenna required 2-1/2 seconds to stop after release of the rotation control, so the 100k pot was set to give a 3-1/2- second delay. The 100k pot can be measured and replaced with a fixed resistor as was done on the unit shown in the photos. The perfboard of my unit was then glued to the plastic relay enclosure on 1/8-inch stand-off strips as shown in Photo A.

A standard 1-3/8" × 1-3/8" × 2" plastic-enclosed

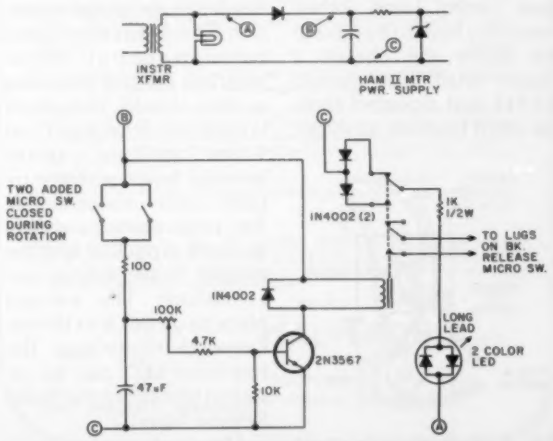

Fig. 1. Delayed-brake modification schematic.

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relay will fit underneath the Ham II chassis if desired. Mine was glued to the top of the chassis just behind the meter and next to the large transformer.

The new microswitches should be mounted next. It is easiest if DPDT microswitches are used. They can be mounted above the rotation control levers, otherwise they have to be mounted below the chassis. I found small ones marked E4-111 and mounted them on small brackets as shown in Photo B. Make sure of the clearance around the on-off switch and calibration controls if you mount them on top of the chassis. Check that the new microswitches are operating properly. Add shims between the microswitch and chassis or between the switch and control lever as needed to get proper operation. Check that the original rotation-control microswitches are still operating as they should. This check is easiest to do at lugs 1 and 5 and lugs 2 and 6 of the terminal board with the rotator cable disconnected. The relay contacts should be wired in parallel with the original brake release microswitch: The easiest place to do this is at the microswitch solder lugs. The two-color LED can be installed just above the Brake Release label.

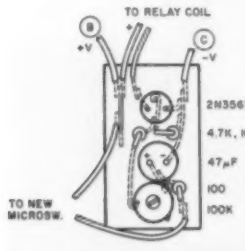

Fig. 2. Typical component arrangement.

The smoke test is next! With the rotator cable disconnected, apply power and check that the relay operates as it should when the control levers are depressed. Check that the time delay is OK and that the LED works correctly. Check that the manual brake release still works OK. Note that the LED does not respond to the manual brake release control. Now connect the rotator cable and you are in business!!

Substitutions

There is nothing critical about the circuit. Resistors of any value near those shown will produce good results. Capacitors in the range of 33 uF to 68 uF should work well. The transistor can be any good-quality NPN type, but it must have a voltage rating of 40 volts or better and reasonably good current gain (i.e., 50 to 100). The relay should be capable of operating on 12 to 20 V dc and its contacts must be able to handle the 110 V ac to the transformer.

My relay was a "hamfest special" marked 20 V dc with a 400-Ohm dc coil resistance. Its contacts looked as though they could handle 5 to 10 Amps; they were about 1/8 inch in diameter. Here is a place to use those relays that do not work very well on 12 V dc.

Diodes should be silicon and have a piv of at least 100 V. The two-color LED can be replaced with two individual ones or a single red one can be used to indicate that the brake is released.

Many thanks to Paul WA2VMS/3 for discussions of ideas about this addition to the Ham II rotator and for describing a similar circuit installed in his Ham III. All of Paul's good ideas were, er,—confiscated (yes, that is the right word!) and used in this article. ■

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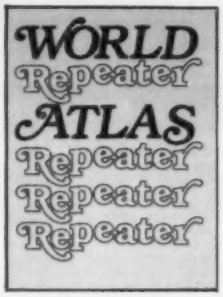

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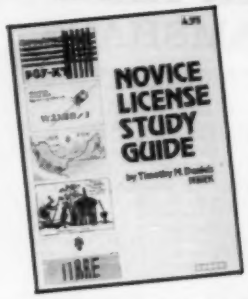

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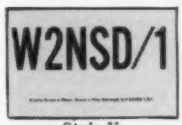

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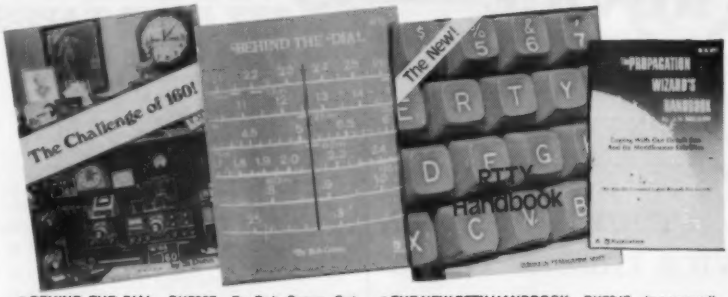

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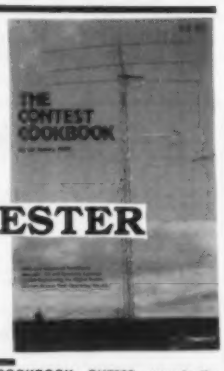

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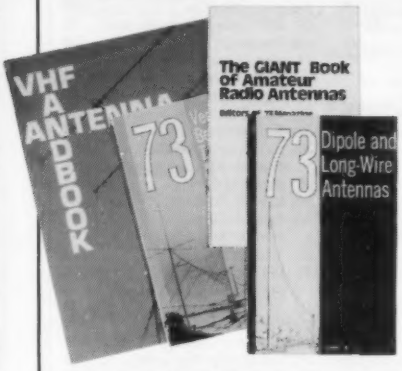

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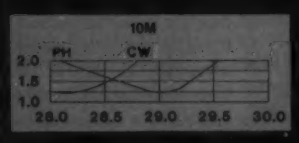

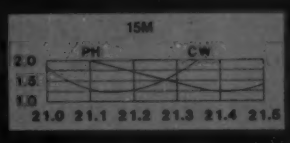

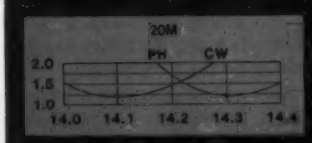

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The Racer's Edge

—it was ham communications at Derby days in Akron

Henry Ruminski WD8JOI
2053 16th Street
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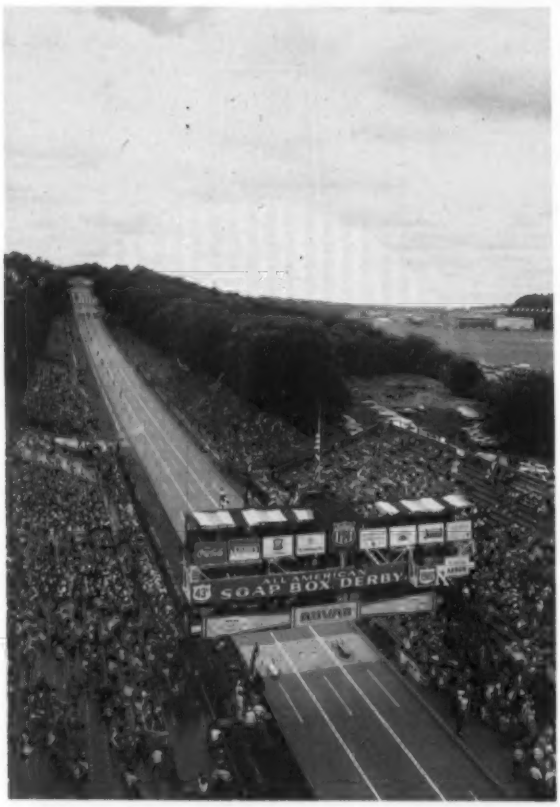
When Dan Purol of Fair Oak, California, crossed the finish line to win the 43rd All-American Soap Box Derby, August 16, in Akron, Ohio, it was doubly appropriate that the checkered flag was waved by Jim Ott.



Derby Downs lies against a natural hill on the eastern edge of Akron Municipal Airport. It has been the scene of the All-American Soap Box Derby for 40 of the event's 43 years.

Given that honor as president of Novar Electronics, the chief sponsor of the All-American Derby, Jim Ott is KB8CT, and he was quick to praise fellow amateur operators who had provided communications for the week-long Derby activities.

"I don't know how we could have run the Derby without the hams. They provided the instant communications which made it possible to deal with any situation quickly," he said.

Wayne Alley, general manager for the All-American Derby, agreed that amateur radio made his job a lot easier.

"We spend 51 weeks preparing for this one week. Without the radio operators, it would be a lot harder. I can be anywhere I'm needed and still have immediate contact with my staff and other officials. That's especially important when I'm traveling between downtown activities and the track."

Alley's "shadow" throughout the week was Gail Wands WB8VNO, who had both 2-meter and 220-MHz handhelds for both simplex and repeater operation. Gail had one of the more active roles since Alley had to handle many questions immediately during Derby week activities and the race.

Assignments for Derby communications were handled by Tim McCleod, operations officer for the Community Amateur Radio Service (CARS) and an Akron school teacher. Communications activity was centered on the CARS .04/.64 repeater which provided excellent coverage throughout the Akron area with the handhelds most operators were using. The club station, WB8DJP, served as net control for Derby activities on the repeater, with routine traffic and rag chewing moving to other repeaters in the Akron area.

Tim's real work began on Monday when the volunteers provided communications for the welcoming of the champs at the Orangerie Plaza in downtown Akron. Since the champs were to assemble at the parking deck of the University of Akron dorms following breakfasts with their families, it was impossible to schedule their arrivals in

WB8YNX assists a parade official during the downtown parade on Friday evening. A second parade was held at Derby Downs immediately preceding the race on Saturday morning.

Workers carefully align each car at the starting line. WD8OCH and his XYL, KA8DRT, provide radio support in the booth in the background.

advance. Eighty-two senior champs had come to the city to try for the college scholarships, totaling $10,000, which went to the top three finishers. The 89 junior division champs were vying for power tools, and the top nine finishers in both classes were to receive trophies. Derby officials wanted to announce the hometown of and to give greetings to each champ on his or her arrival at the plaza. To do this, Tim arranged for operators to be on duty at the pickup point, at strategic corners downtown, and at the plaza to pass on the needed information. Each champ was correctly introduced as he arrived with a police escort.

While Gail WB8VNO was providing communications for the Derby manager, her husband, Ted Wands WD8CVH, was helping with the arrival of the champs. Another husband and wife team, the Musgraves (Scotty K8UCN, and Barb WD8DAI), were working at the pickup point with the champs.

Two other husband and wife teams assisted in the Derby communications effort. Larry Wilson WD8POL and Peggy WD8PZO assisted at "topside," the area where the cars were stored, weighed, inspected, and prepared for their run down the hill. The pair handled the post during the trial run which each contestant had on Wednesday and during the race itself. Carl Hanson WD8OCH and Audrey KA8DRT provided radio contact at the starting line on race day.

These couples were just a few of the amateurs who provided communication between the Derby Hall of Fame in the Convention Center downtown and the track throughout the week as entrants were weighed, took trial runs, and participated in the activities planned for the champs.

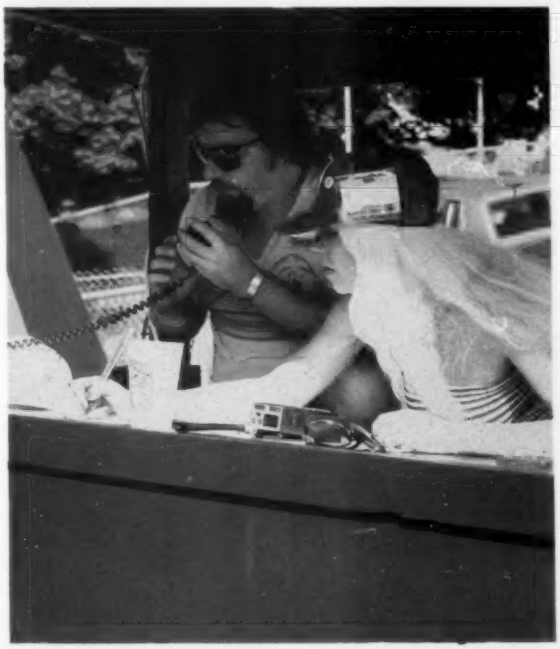
Alley and other officials were particularly impressed with the phone patch capability of the repeater.

"My secretary could find me whenever she needed me no matter where I was, simply by dialing the phone! It made my job easier and saved a lot of time. It helped things run more smoothly," Alley said.

Derby officials were quick to point out the service of Jim McCrory WD8RDW, who was home on vacation from the Ohio State School for the Blind in Columbus. Jim spent most of the week manning 2-meter and 220-MHz rigs in Derby headquarters, located under the grandstands at the track in southeast Akron. Jim, who has his General license, became a ham in 1978; he said he enjoys operating the 2-meter rig he has on loan from the Goodyear Amateur Radio Club and hopes to acquire his own rig when finances permit.

Though the activities which Jim and others helped with during the week were important, they were just more preparation for Derby officals and the communications team for the big day. Saturday, August 16, when a parade down the track, a skydiving exhibition, and 91 heats would all have to take place.

Amateur radio helped to ensure that this year's race went like clockwork. That has not always been the case. Alley recalled one incident which, while it had no serious consequences,



WD8POL and XYL, WD8PZO, work at the topside control booth during Wednesday's trial runs.

WB8VNO provided communication for Derby general manager, Wayne Alley, seen here talking to one of the deputies at the track.

WB8VNO provided communication while Derby officals discussed the race with Kazumi Hotai (right) of Tokyo Television, who taped segments for a special on children of the world.

WB8CBO (left) and WD8CVH operate CARS station WB8DJP on race day from the bridge across the race track.

was embarrassing to the people involved.

Two years ago, a skydiving team was to exit the plane, free fall, and land on the Derby track at the conclusion of the parade. A smoke grenade set off at the tower was to signal the team to jump, and the track announcer was to call the crowd's attention to the team. Unfortunately, a cannon was set off to signal the start of the parade. The smoke from the cannon apparently looked like a smoke grenade from 12,000 feet, and the skydivers arrived considerably ahead of schedule.

Since this year's Derby included another skydiving exhibition, Bruce Bechtol K8VAK flew with the team and provided both 2-meter and 220-MHz communication with Jeff Brown WD8MMN, at trackside. Jeff was to keep Bruce informed about the timing of the jump.

When Bruce arrived at the airport, the jump team and the pilot expressed some concern about the cloud cover and the wind. After a discussion, they decided to see how conditions were higher up and to make the decision then.

The wind and clouds did present a problem, and Bruce was able to inform officials on the ground of the situation. The track announcer was able to point out to the crowd that the team would be jumping from about 5000 feet with no free fall because of the conditions. In addition, radio communication also allowed the announcer to re-

WD8DAI provided radio communication for the VIP booth on race day. Immediately behind her is KB8CT, president of Novar Electronics, chief sponsor of the All-American Soap Box Derby.

WD8POL, his XYL, WD8PZO, and N8AHJ take a break at the control booth during a lull in the heats on race day.

assure the crowd quickly that one skydiver, who had been blown into a fence while landing, was not injured. The team said there would have been confusion on the ground if they had not been able to communicate the change in plans to the announcer.

With the parade and skydiving completed, the race became the important event. There were two classes, junior, for boys and girls 10 to 12, and senior, for entrants 12 to 15. A 12-year-old could choose either division, and this year's senior winner was 12.

For each heat, two or three cars, depending on the pairings, were placed on the starting blocks, the blocks were dropped, and the cars rolled down the 953-foot racing strip to the finish line where the first car across tripped an electronic timer—and a camera shutter, to provide photos for the judges in races which were too close to call with the naked eye.

After crossing the finish line, the cars had a 1,200-foot runout area in which to slow to a stop. Since each car had a brake, most stopped near the stand, about halfway through the runout area. At that point, if a winner had already been declared over the public address system, Derby volunteers consoled the "losers." (The term loser is never heard at the Derby. Officials throughout the day call each entrant, "champ," since each got to Akron by being the champ of some local derby.)

The winner then waited until two other winners were available and the three drew for lanes in the next heat. K8UCN handled the lane assignment chores since enough other volunteers were available for radio duties. After drawing lanes, the winners and the cars were returned topside, where they waited for their next run.

If the Derby were to run smoothly, action had to take place simultaneously at topside, the starting line, the finish line, and the runout area. Safety was the first concern, and an amateur radio operator was stationed at each location. They were coordinated by WB8DJP, operated by WD8CVH and WB8CBO. The control station was located on the second level of the bridge at the finish line and just behind the announcer so that information could be passed on to the crowd quickly.

In addition, a telephone line connected each station, and, leaving nothing to chance, another heat was not run until each point had given the okay. In addition to radio and telephone communications, a system of red and green lights and red and green flags was used. No car could leave the starting line until a verbal go ahead had been given and both the green light and green flag were visible.

Fortunately, this year there was no serious emergency to test communications capabilities. The few entrants who brushed the wall walked away and shed tears more from the agony of defeat than from any injury. The Akron Fire Department Emergency Medical Team and a US Army Reserve medical team careful-

K8VAK, who provided aerial communication for the skydiving exhibition, has his chute adjusted. Bruce used both 2-meter and 220 handhelds.

K8UCN coordinated lane selections as each heat winner arrived in the runout area. In the background is the Goodyear Air Dock, the largest building without interior supports.

WB8YNX and KB8CJ provided radio communication in the runout area.

ly examined the few champs who bumped the wall. The only damages were to the pride of the youngsters, some of whom had traveled many miles to represent their hometowns and countries. The race included champs from Germany, Venezuela, and Canada.

Other hams working Derby day included Clyde Lorenz WB8YNX, Jeff Ruoff N8BFU, and Tom Haynes KB8CJ (who were stationed in the runout area), Paul Banquer WD8MDG, who was at the finish line, and Bob Cronauer N8AHJ, Ken Langford WD8QWD, and WD8DAI, who provided communications for various Derby officials.

Bruce Rodenkirch WB8WFD shadowed the NBC crew which taped segments of the race for use during October on the new series "Games People Play." Bill Hessler W8DXT provided communications for Kazumi Hotai and his Tokyo television crew which was shooting footage for a special program on children of the world.

Ken Slezak N8BYS, who was stationed halfway down the track, had the most uneventful post. His only action was to check on an entrant who had applied his brake and stopped in the middle of the track after a shroud on his car loosened and blocked his vision.

It's not possible to name all the hams who helped during the week with the Derby or who might have helped give directions on Derby day on the other repeaters in the Akron area. Nor is it possible to mention all the clubs which were

represented by the people participating. But it is possible to tell a little more about the ham who helped make it all possible, Jim Ott KB8CT.

In the fall of 1972, Chevrolet officials (who had first sponsored the Derby in 1936) decided to withdraw their sponsorship. The Derby was sponsored by local groups until the fall of 1975 when another national sponsor was found. Novar Electronics of Barberton, an Akron suburb, pledged $165,000 toward the next Derby, and has supported each Derby since.

Ott, who was first licensed in 1962 as K8CAA, founded Novar when he was 17. (Novar stands for Northern Ohio Video and Radio.) Ott had gone to Ohio State University to study electrical engineering. While working with a deaf student there, he developed the Whisperlite, a device which converts sounds into light. When commercial interest in the device developed, Ott quit school and founded his company which, today, is a recognized leader in security systems including a new identification system which uses the vibrations created by the human body.

Though the Novar name is prominent during Derby week, on T-shirts and other Derby promotional materials, Ott does not make commercial use of his sponsorship during the rest of the year.

On race day, he said, "It's fun to be here seeing the kids enjoying themselves. This is a great program and I'm happy to be able to contribute."

Jim said that his work doesn't give him as much time on the air as he would like, but if you do hear KB8CT, jump in and say hello to a ham who helped make August 16 an important day to 91 champs. ■

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Amateur Radio Profiles

KB8CT waves home the final heat of the 1980 All-American Soap Box Derby. Dan Purol of California, in the red car, took home a $5000 scholarship and a California Replicar kit in addition to the trophy.

KB8CT presents the senior division All-American Derby trophy to Dan Purol of Fair Oak, California.

R.L. Gruner W4UFT
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Perfect Parabolas

—use some solar technology on your next dish antenna

I became interested in building an MDS TV converter after reading an article in the August, 1979, issue of *73 Magazine* entitled "You Can Watch Those Secret TV Channels."

After building the converter and coffee-can feedhorn, I was concerned over the number of trees between my location and that of the MDS transmitting station. A line-of-sight path is normally required at the frequencies used for MDS TV and trees greatly attenuate signals. I suspected that I would need an antenna with more gain than that of the "snow-saucer" type.

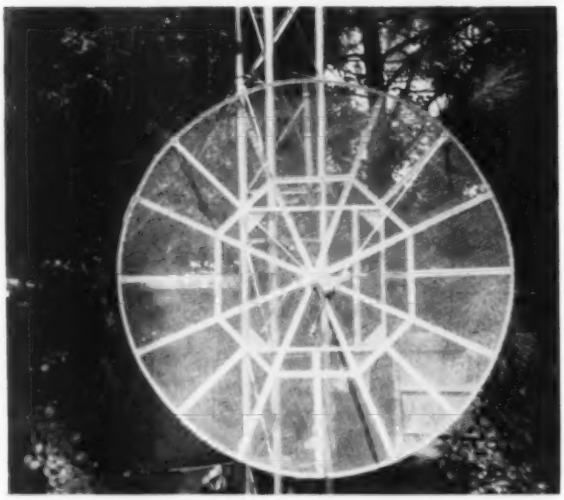

Photo A. Front view of completed four-foot dish showing rib structure.

Whenever UHF or microwave frequencies are mentioned, I form a mental image of a parabolic dish. However, they are expensive and I knew nothing about designing or building them. So what do I do now?

Research

After a long and fruitless search through my limited library of radio publications, I was ready to give up when I spotted my *Solar Energy Handbook*. It contains information on collecting light waves with parabolic reflectors. Having read that the properties of high frequency radio waves and light waves are similar, I decided to design and build a parabolic reflector based upon the information in the book. This information is shown in Figs. 1(a), 1(b), and 1(c) and illustrates three approaches that can be used to produce a parabolic curve.

Design materials needed are:

- Several sheets of linear graph paper
- Straightedge or ruler
- Compass for drawing circles
- Pencil
- Piece of wood—1" × 6" × 24"
- Approximately 5' of string
- 4' × 4' piece of plywood or heavy cardboard

Dimensions

Due to my limited knowledge, my choice of dimensions was based upon common sense and convenience. Choosing a diameter of four feet for high gain and a focal length of 26 inches so the feedhorn mounting tube could be short and rigid, I followed the instructions shown in Fig. 1(a). I let each square on the graph paper represent one inch (not shown for purposes of clarity).

After marking the graph, it is necessary to obtain a full scale graph. This is accomplished by drawing vertical and horizontal lines 1" apart for the full length and width of the 1" × 6" × 24" board. Having done this, observe the markings on your graph paper and mark the corresponding points on the 1" squares on the board. If you draw a line from point to point on the board, you will have a full-scale pattern on the board for forming the ribs of the dish. See Fig. 2.

Attach the 5' length of string to the center of the 4' × 4' plywood and, holding the pencil tightly against the string, draw a four-foot diameter circle on the plywood. This is your "rim" pattern. A complete list of materials is provided in the Construction Materials box.

Construction Details

Cut eight 22½" pieces of "Tee" metal and bend each of these so the flat surface will conform to the pattern on the wood graph. Be accurate because these 8 pieces are the ribs which establish the curvature of the dish. Refer to Fig. 3 for the following assembly steps.

Position the most curved end of the ribs in 1" from the outer edge of the pipe flange. Attach these eight ribs so the flat side will be against the bottom of the flange and will radiate outwardly with equal spacing. This should form a hub with eight spokes.

Keeping the flat side outward, carefully bend a length of the Tee metal around a large round object such as a 55-gallon oil drum and make a four-foot circle to match the circle on the plywood pattern. Using flat strap aluminum as a backing plate, attach the ends of this circle to form a 4' hoop or rim.

Attach the rim to the top of the eight ribs. Measure in 12" from the rim and attach eight pieces of Tee metal braces between the ribs to form an octagon-shaped circle on the rear of the dish. Attach eight more pieces of the Tee metal from the octagon-shaped circle to the rim, centered between each of the main ribs. See Fig. 3(d).

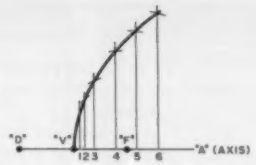

Fig. 1(a). If vertex "V" and focus "F" are given on axis "A", mark point "D" so that "DV" = "VF". Draw lines perpendicular to the axis at any points, 1, 2, 3, 4, 5, etc. Bisect each with an arc drawn from "F", with a radius equal to the distance of the particular point from "D". Thus, bisect line 3 with radius "D3" drawn from "F".

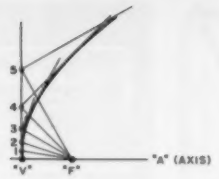

Fig. 1(b). If, as in 1(a), vertex "V" and focus "F" are given on axis "A", draw line from "V" perpendicular to axis. Mark any point on this line (1, 2, 3, etc.) and connect it to "F". Draw a line from each point at right angles to the line to "F". (Thus, from point 5, draw line at right angles to "5F".) Each of these lines will be a tangent of the parabola, which must be drawn inside these tangents, touching each section at its center.

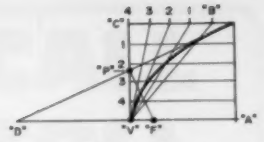

Fig. 1(c). If vertex "V" and axis "VA" are given as well as width "BA", draw "CB" parallel to axis and "CV" perpendicular to axis. Divide both into an equal number of equal sections (1, 2, 3, 4, etc.). Connect "V" to each point of "CB" (radial lines). Intersect each radial line with parallels drawn from corresponding points of "CV". The intersections are points of the parabola. Mark point "D" on extension of the axis so that "DV" = "VA". The line connecting "D" with "B" is a tangent at "B". Where "DB" intersects "CV", mark point "P". Draw line from "P" at right angles to "BD"; this will determine the position of focus, "F", on the axis.

Dish Support

The dish supporting and mounting frame is made by making an 19" × 19" square with Tee metal. See Fig. 4. Each corner is braced with a 16-gauge triangle cut from the 4" × 4" sheet of aluminum. The frame is attached to the rear of the dish with 5" lengths of Tee metal. Additional braces from the frame to the dish are formed with the four 16-gauge 1" × 6" aluminum strips.

The two ½" × 8" aluminum strips are formed around one leg of the tower and will bolt to the rear, flat surface of the frame when the dish is mounted on the tower.

The 7/8" o.d. tubing, 3" long, is slipped over the ¼" × 19" aluminum tubing and the 19" tubing is attached to the upper and lower frame members. The 7/8" U-bolt clamps the 7/8" sleeve to the ½" × 23" aluminum tubing which will form the adjusting arm for the dish. This 23" length of tubing is inserted through a clamping bracket which is attached to another leg of the tower.

Covering the Frame

Using ¼" mesh wire (hardware cloth) or aluminum window screen, cut four pie-shaped wedges and attach them with bare aluminum wire to the ribs of the dish. The "tie wires" are bent into a U shape and inserted through the mesh over the braces. They are spaced at 2" intervals. This causes the mesh to closely follow the curvature of the ribs when the wire is twisted. For a neater appearance, you may wish to spray the entire assembly with aluminum paint as I did.

Testing

After construction came

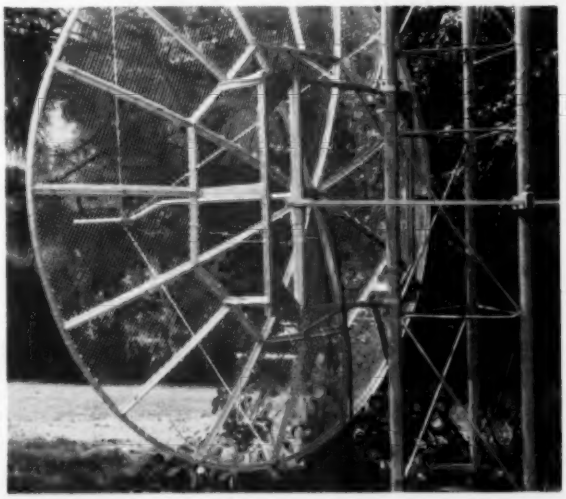

Photo B. Rear view of dish showing mounting details.

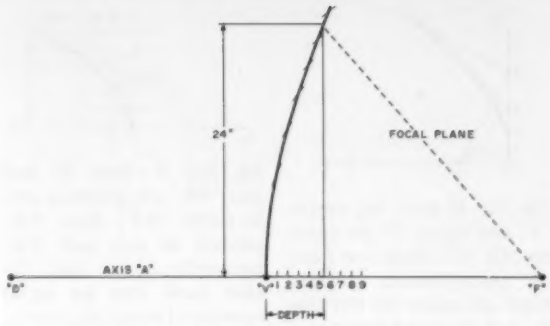

Fig. 2. Details for making full-size construction pattern (top half of the parabola graph).

Construction Materials

½" × ½" × ½" Tee-shaped aluminum strips
Small nuts and bolts or "pop rivets"
3-inch pipe flange
¼" mesh wire (hardware cloth) or aluminum window screen—enough to cover the reflector.
Aluminum tubing, ¾" o.d. × 19" long
Aluminum tubing, 7/8" o.d. (¾" i.d.) × 3" long
Aluminum sheet, 16-gauge, 4" × 4"
Aluminum strips (2), ½" wide × 8" long
Aluminum strips (4), 16-gauge, 1" × 6"
Aluminum strip, 16-gauge, 1" × 2¼"
Aluminum tubing, ½" × 36"
Aluminum tubing, ½" × 23"
1 U-bolt clamp (to fit 7/8" pipe)
1 U-bolt clamp (to fit tower leg)
Several feet of aluminum wire (clothesline wire), small gauge

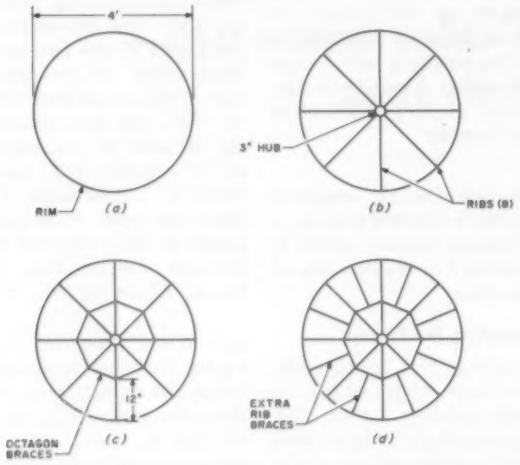

Fig. 3. (a) Rim dimensions. (b) Spoke installation. (c) Octagonal bracing placement. (d) Installation of extra rib braces.

the pleasure of testing something that worked right the first try. I was fortunate enough to have a Gunn diode oscillator operating at 10.5 GHz and the waveguide-horn from an old police radar detector. The Gunn oscillator was set up facing the waveguide detector at a distance of ten feet and the meter reading was noted. The Gunn oscillator was then pointed at the mouth of the dish, and by standing to one side and moving the detector around, I was able to locate the point of highest rf concentration. This point was 26½" from the vertex of the dish, only a half-inch off the design and now the meter read full scale (100 microamperes). This was much greater than the direct reading without the dish, indicating a great deal of gain.

The Gunn oscillator was then moved to a point three feet from the front of the dish and the detector was used at the rear of the dish to check for rf leakage through the mesh cover. None could be detected. This would seem to indicate that spacings greater than ¼" could be used for frequencies below 10.5 GHz.

Miscellaneous

The pipe-flange center hub makes horn attachment easy. You may wish to thread a short pipe nipple into the flange and slide a piece of aluminum tubing or PVC plastic over the nipple to mount the horn. You can clamp the two together with screw-type pipe clamps or hose clamps.

Conclusion

If you should build a parabolic reflector from the solar book information given, I believe that you will be well pleased with the results. I certainly am. I have become so interested in the design of dishes that I have completely dropped the MDS project and I am presently contemplating a 12 footer for satellite reception. Good luck. ■

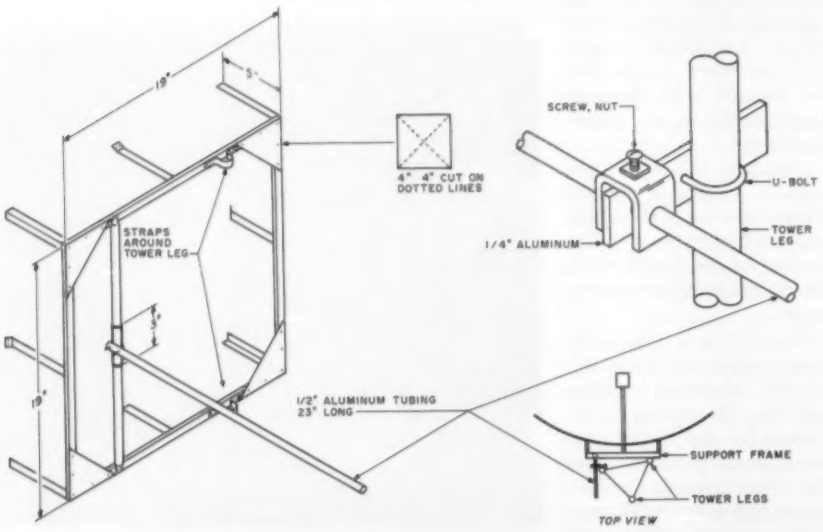

Fig. 4. Supporting and mounting construction details.

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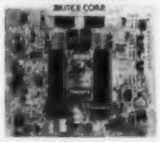

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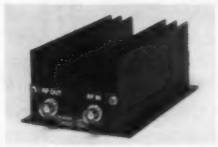

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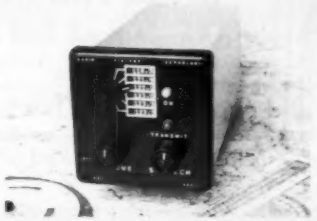

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Help for the HW-2036

—hum mods for Heath-equipped hams

Almost immediately after I put my Heathkit® HW-2036 on the air, two problems cropped up. First, there was a terrible hum on the transmit audio whenever I tried to work through a repeater, and second, the phono plug coax connector kept coming loose. Daunted but not defeated, I put the thing back on the bench and proceeded to dig into the problems with great exuberance.

If you live in an area that doesn't require a Private Line® (PL) for repeater access you may never have noticed the hum. But if you use PL you undoubtedly have been told that you have a noticeable—if not objectionable—hum on your signal. It's not humming because it doesn't know the words, it's humming because the injection level is simply too high. Unfortunately, Heath did not see fit to include a level adjustment. Enter modification #1.

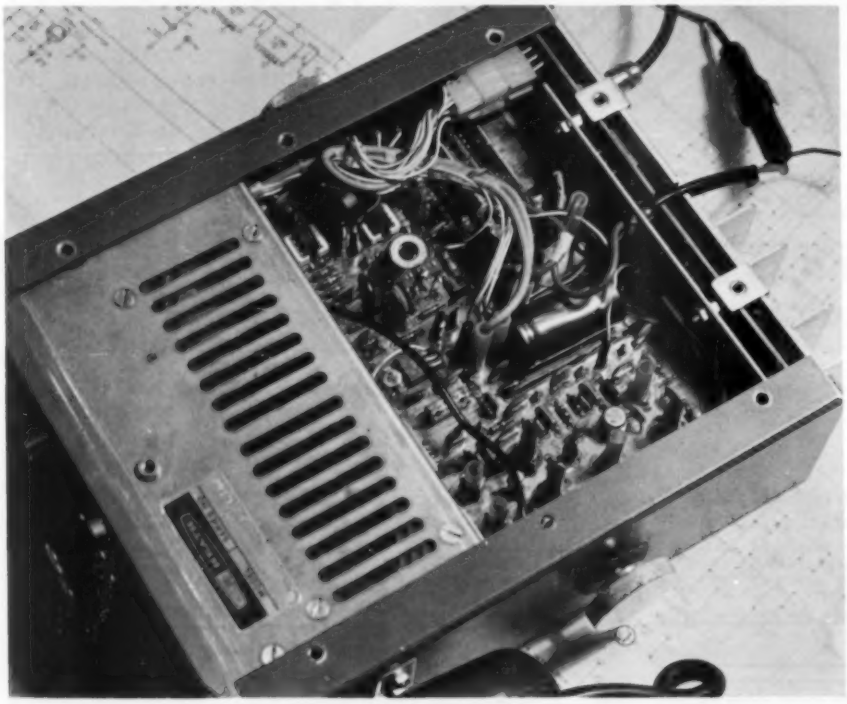

Photo A. This shows the completed modification. The PL adjustment pot is mounted horizontally behind the deviation pot. Note the coax pigtail at the antenna jack.

The square-wave output from the tone generator is fed through several stages of RC filtering to R134, a 470k resistor. (See Fig. 1.) Although R134 is part of the waveshaping network, its actual value does not appear to be critical. Replace it with a pot and you'll have a tone level adjustment.

In my first attempt at this mod, I used a 750k pot—and promptly ran out of adjustment range! A second trip to the junk box produced a 2.5-meg linear PC board pot that worked very well. Actually, any value from 1 to 5 meg will work. The lower the value, the easier it is to adjust—but the more you risk running out of adjustment room.

To prepare the pot, first

solder one end terminal and the arm together. Then solder about 3/4-inch lengths of wire to each end terminal. Bend the leads straight back from the front of the pot and set it aside for a few moments.

Pull the bottom cover off the rig to expose the transmitter circuit board. R134 is located behind the deviation pot. (See Fig. 2.) Snip the resistor in half, crush the carbon and composition from the leads, and bend the leads straight up. Now solder the leads from the pot to the leads protruding from the circuit board. Be careful—not too much heat—you don't want the solder to flow on the foil side of the board.

To adjust the pot, set it for about 500k and get into a QSO on a PL-controlled repeater. Slightly increase the resistance on each transmission. When the other stations report that they can no longer hear the tone, note the position, but continue increasing the resistance until you can no longer hold the machine. Then set the pot midway between those two points. If you find that you can no longer hold the machine while the tone is still audible, check the frequency of the tone.

As long as you have the rig on the bench, you may as well consider one other simple mod. My rig is in and out of the car several times a day. At that rate, it didn't take long for the phono plug coax connector to become loose and intermittent. After taking the rig apart several times to tighten up the connector, it finally dawned on me that there must be a better way.

One way would be to replace the phono jack with a chassis-mount BNC connector. That would require some (slight) mechanical rework of the box, however. Since my mechanical ability is zero—I can't even put the cap on a peanut butter jar without getting it cross-threaded—I began considering alternative solutions. I decided that a short piece of coax and a few connectors could do the trick.

For most practical purposes, the input and output characteristics of a half-wave section of coax are the same. If you were to solder a half-wave section of coax to the output of the rig, you would effectively move the output point to the end of the coax. That is the theory.

To put theory into practice, solder a UG-89/U BNC connector to one end of a piece of solid-dielectric RG-58. On the other end, solder a phono plug. The distance from the open end of the UG-89 to the tip of the phono plug should be 24-1/2 inches.

Now, tack solder the phono plug to the antenna connector on the rig. I emphasize *tack solder*, because you may eventually have to take the rig apart for maintenance, and a completely soldered connection would be a bear to get apart.

Replace the phone plugs in your car or shack, or wherever else you operate, with UG-88/U connectors; you'll be back in business without intermittent coax connectors.

There are several other mods which I would like to describe in future articles. In the meantime, you can enjoy operation without intermittent coax connectors and without the hum. ■

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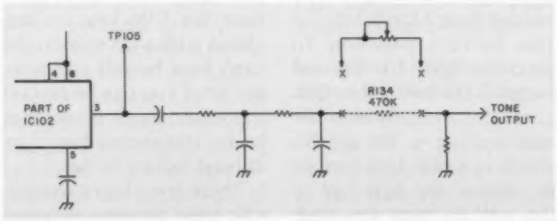


Fig. 1. The tone generator, IC102, and the electrical location of R134 in the output circuit.

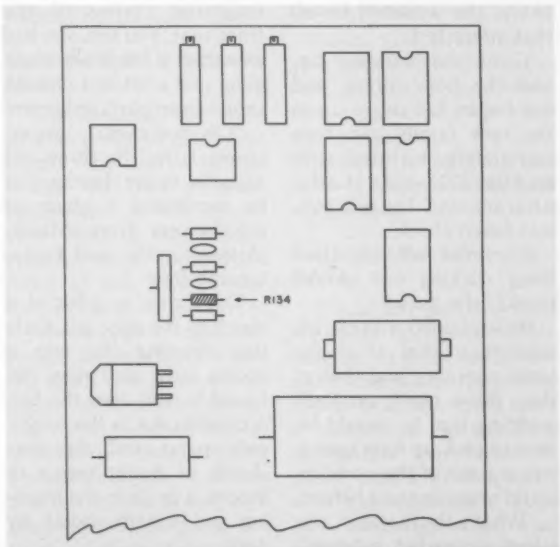


Fig. 2. The physical location of R134 behind the transmitter deviation pot. Most minor components have been omitted for clarity.

✓Reader Service—see page 82

Andrea Favara HR1ADF
Apartado Postal T-243
Tegucigalpa, Honduras
Central America

The Honeymoon is Over

—hints and kinks for ham husbands

Let me tell you the tale of K9CNC and how he turned a YL into an X-XYL through the marvels of amateur radio.

A bright and shining boy was he, happy in love with his bride-to-be, and an eager radio amateur, as well. He never thought to tell the love of his life much about his involvement with radio, thinking that, most likely, she wouldn't be all that interested.

Came the wedding day and the honeymoon, and our happy lad drove up in the new family car, now completely outfitted with an Atlas 210X and a Hustler whip antenna. The new Mrs. was taken aback.

"...and what's that thing sticking out of the trunk?" she asked.

He explained with boyish innocence that it is for radio contacts, and that as they drive north on their wedding trip, he should be able to pick up ham operators in parts of the world he could never contact before.

"What's the matter?" she asked somewhat subdued. "Don't you want to talk to me?"

Well, they were off. Somewhere along the Florida turnpike he picked up Australia. As they reached Georgia, British Columbia was 20 over 9.

"Just sitting here with my XYL, driving up to New York City and watching the stars come out," he purred contentedly to a CQer from Pago Pago.

"What's an XYL?" the new bride asked from her forgotten corner of the front seat. You see, she had expected a bit more snuggling and a lot less conversation from parts unknown.

"Oh, that's you... my ex-young lady," he threw off casually in her direction as he monitored a group of rag-chewers from Maine, Massachusetts, and Guantanamo Bay.

This came as a bit of a shock to the poor girl. Only this morning she was a young lady, and now she found herself over the hill. A doubletake to the bright, gold band and the first shreds of doubt began to bloom: a bride in the morning and a ham widow by dark.

Slowly our little bride came to hate the squawking little black box and to look on with embarrassment and discomfort when the antenna worked itself loose and tangled up traffic, as it frequently did. The honeymoon was over. Quickly.

Moving in to the new QTH only added to our XYL's joys. Where was her OM? Helping to carry the packing crates upstairs, deciding where to put Aunt Mary's lamp, or adjusting the water heater? 'Course not. He was hanging by his heels out their 9th floor apartment window, making the final arrangements on his dipole.

"My heavens," she breathed. She would really be a ham widow if he wasn't more careful. He survived sufficiently, however, to commandeer her best table for his transceiver, meters, and tools, smiling as he placed Aunt Mary's lamp in the perfect position to properly light his log and happily scattering his QSL cards decoratively over her new wallpaper. He got his shack in order long before he tapped the first nail in the wall to hang the wedding pictures.

Life went on for the XYL and her OM. He came home from the office, kissed the little woman hello, and headed for the shack. "K9CNC here on schedule," while the dinner got cold and the XYL began a slow burn. One day she had had enough. She left the ring on his QSL cards, murmured a quick 88, pulled the plug, and QSTed.

How to Keep Your XYL from Becoming an X-XYL

Poor K9CNC was a sorry case, indeed. Radio wasn't the only cause for his problems, but it was a contributing factor. It is an acknowledged fact that a radio operator can appear to be a strange breed of cat, especially to a wife who has no personal involvement with the romance of the airways, except to watch the back of her husband as he hunches over his CW key or rag-chews with a DX station she can't hear herself and wonder *why?* You can be certain she would much prefer that he be romancing her... or at least *talking* to her.

There are a lot of women who have become resigned to being ham widows. They've gotten accustomed

to watching the food get cold on the dinner table while they nag at their microphone-mouthed maniacs, or while they stand by the door, waiting for their Good-Samaritan husbands to finish that last, never-ending phone patch, as the concert starts without them or the shopping center closes for the night.

As an XYL myself, I can vouch that tolerance and understanding did not come easy. It took until I became a radio amateur to come to understand the ties that bind the enthusiastic ham. You don't have to turn your wife into an Extra-class operator to make life more livable, but with a few reminders, you might just be able to turn off (instead of tuning out) her long-suffering sighs, give her a greater appreciation for your hobby, and turn her on to the magic of radio for herself. Be careful, now. Don't be too good at this or you might find yourself a ham widower.

Introduce Her To the Hobby

Don't lecture, but do make it a part of your daily conversations to fit in explanations about simple electronics, history statistics, and/or the motivations that make for a radio amateur. She will become a more understanding part of your world when you share it with her.

Explain It To Her

If you are a serious ham and enjoy spending time with the rig, explain that from the onset. Tell her it is a hobby you enjoy, have long cultivated, and from which you take great pleasure. She'll appreciate the pastime more if she understands what you went through to master the code and pass those exams and sacrificed to construct or purchase the equipment. If she is new to the game, she is going to be doing a lot of wondering, as she sits alone watching TV or reading a book, as to why you have so much to say to strangers and nothing to say to her.

Explain the Lingo

Don't offhandedly throw out an explanation (as K9CNC did) that XYL means ex-young lady, without cushioning the blow. When you know nothing about the jargon, a young lady is one thing, while an ex-young lady is something else again. Don't rattle off abbreviations she couldn't possibly have any background knowledge about, as you spin your dials and rotate your antenna. Take the time to *stop*, give her your full attention, and answer her questions, no matter how simple or how complex. She'll retain information presented this way, believe me. It seems one of the great complaints from non-hams is their failure to understand what is being said. It turns them right off.

Don't Be Condescending

If you are going to try to make your hobby understandable to a wife who has difficulty plugging in the toaster or setting the clock, don't lecture as if you didn't expect her to understand. Again: Answer her questions. Explain a point as many times as it takes, if she is interested . . . but *don't* get angry at her if she still doesn't understand. After all, it is not her hobby: It's yours. She might pleasantly surprise you someday with her knowledge, as she proudly shows off your shack and finds she can speak intelligently about the operation of your Yaesu, Kenwood, or Swan.

Never Put Your Shack Before the Needs of the Household

Even the most unmathematical of wives can quickly calculate the difference between the time it takes for you to run down to Radio Shack when you need a new connector or a piece of 75-Ohm coax and how long it takes for you to take out the trash, get around to mowing the lawn, or to bring home a new stopper for the sink.

Make the Shack a Welcome Place

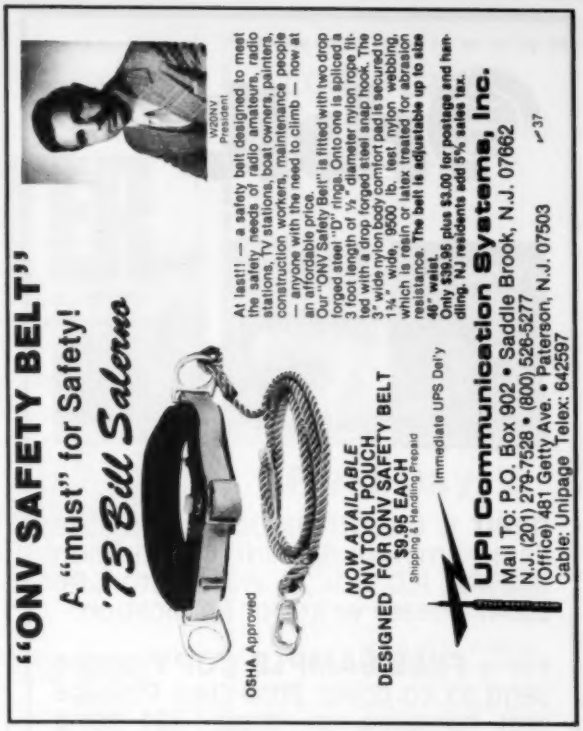
Just because the little woman is not an electronic wizard, she *can* be trusted within 10 feet of your equipment. If she moves your dials or misarranges your meters or tools, don't jump at her. Instead, use the incident as a way to continue your introductory course in electronics. Make the shack and your equipment comfortable, interesting, and familiar to be around. Turn the shack into a place where she can come and *talk* to you as well as a place where you go to talk to your fellow aficionados. When she brings you that needed cup of coffee, occasionally ask her to pour one for herself and join you. Show her the same courtesies you show to your fellow hams on the air.

Don't Let the Hobby Get Out of Hand

Don't turn every available space like the backyard, garage, or spare room into a graveyard for electronic equipment. It's easy to become a collector, but keep it within reason, and keep it neat.

Encourage Her Interest in Radio

If your XYL gets bitten by the radio bug, become her teacher, or point her in the right direction toward a course of study. You'll have a partner in the shack, a worthwhile experience to share, and a little woman who can appreciate your true meanings when you tell your fellow amateurs you've got an XYL that's 40 over 9. That's some Young Lady. ■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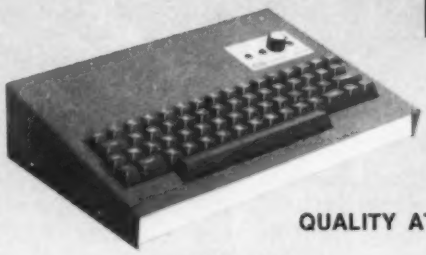

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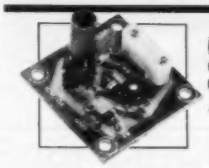

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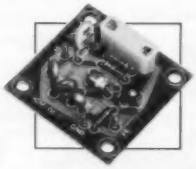

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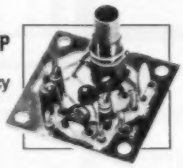

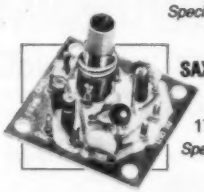

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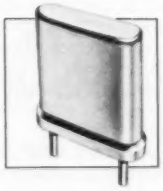

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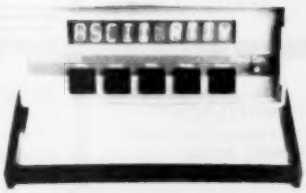

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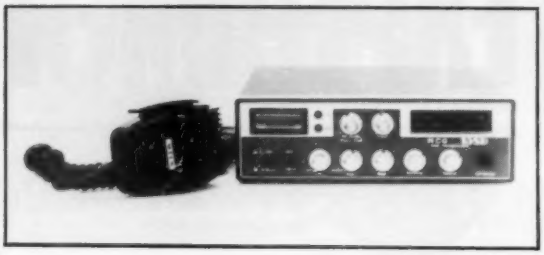

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Any fool knows all these things aren't going to happen to you at once. But if it is 'one of those days' maybe you can just forget the whole mess and brighten your and someone else's day a little by taking some time to think of a fellow ham you admire and respect to nominate for Dayton's "Amateur of the Year Award" for 1981. No, it's not too early to think about it. It does take a little time and effort to nominate some one for "Amateur of the Year."

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His contribution to amateur radio may be in any of the hobby related areas. Possibly his greatest contribution is in the engineering field of our hobby, or his expertise may be in antenna design, some new type of modulation or an improvement to existing design, etc. Maybe he has contributed greatly to improvement of amateur regulations or possibly his contribution is the legal field of our hobby, a very important one these days. Get the idea? In short, an outstanding individual and amateur.

In 1974, another award was established, the "Special Achievement Award." This award is just what it would seem to be — an award for one-time special event or specialized activity by an amateur or group of amateurs. This activity may be in the engineering field — QRP — DXpeditions —net activity — emergency work or any one-time outstanding activity related to the amateur radio hobby.

Nominees for both of these awards may be from anywhere in the world, not just the U.S.A.

So! Don't just sit back and say, "Gee!, somebody ought to nominate that guy for "Amateur of the Year." Don't wait for George to do it. Give us all the details you can gather, especially activities that are directly attributable to him or her.

All nominations are carefully reviewed and are saved from one year to the next for future consideration and to allow some nominees to develop to their full potential. All nominations are considered for both awards, and the awards will be presented at the 1981 HAMVENTION Banquet.

So, have you nominated some one in the past? You may want to renominate him with update on recent activities or just send in update information on his latest accomplishments.

Do it now! Besides you may win a set of free tickets to the "HAMVENTION" for your nominee and yourself.

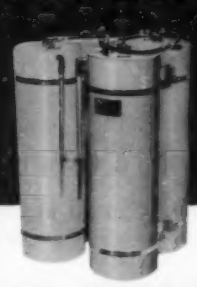
For more information or nomination blanks (not mandatory) write to the address below:

HAMVENTION
P.O. Box 44
Dayton, Ohio 45401
Attention: Awards Committee

or

Bob Roettele, W8UNV
Awards Chairman
1299 Hanes Road
Xenia, Ohio 45385

DUPLEXERS



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CB to 10

—part XXX: the Midland 13-866

The basic applications of this conversion will apply to most CB chassis using the 23-MHz series of crystals. The chief difficulty with this radio, which uses no crystal trimmers, is to figure the pF load for the crystals needed. The load of the circuit is about 58-60 pF, but since the crystals are third-overtone cut, the load to request is about 22 pF cut for third overtone operation. There are two methods of approaching this chassis, but changing the 23-MHz crystals is recommended. The formula is simple: Just add 2 MHz to the existing crystals.

The crystals required are: 25.290, 25.340, 25.390, 25.440, 25.490, 25.540.

Changing these crystals is simpler on an initial conversion because their fundamental range is only 8 MHz, and they are far easier to work with than fundamental 16 MHz crystals. In addition, it is possible to add 24 more channels to the synthesizer circuit by use of a 4PDT switch and four more crystals. Frequencies needed are: 15.220, 15.230, 15.240, and 15.250 MHz, which are stock items at most crystal houses, and range in price from $3.50 to $6.00 each (so shop around).

Activating the channel 24 position can be accomplished by locating the white wire coming from the selector switch and going to TR6. Using a piece of hookup wire, as diagramed, or a spare wiper from an old rotary switch, solder it to this terminal in such a way that it makes contact with the switch when the defeat cut in the switch meets the normal wiper. (Refer to Fig. 1.)

Install the new 25-MHz crystals in place of the ones removed from the circuit board. Apply power to the set, and with a frequency counter check for oscillation at the collector of TR6. If the oscillator is not functioning, back out the slug on T6 until the circuit fires. With TR6 oscillating, you now can proceed with the tune-up procedure.

Connect a signal generator through a .01-uF capacitor to the base of TR17. Ground the generator to chassis ground, not the case. With the set on channel 13, (23 if you are installing the 15-MHz crystals as well), inject a 29.115-MHz signal with 1000 Hz, 30% modulation (29.255 MHz for channel 23). Adjust T12, T13, T14, and T15 for maximum receiver output.

Key the transmitter into a dummy load with a wattmeter connected and tune T1 through T9 for maximum rf output. The relative output function of the S-meter may be used for this initial tune-up. Then peak C24 and L5 for maximum power output. At this point, you should have about 2- to 2.5-Watts output. The value of the tank coils in these sets varies greatly, and it may be found that maximum power output occurs when the L5 slug is all the way out. If this is the case, replace C22 (150-pF capacitor) with a 100-pF ceramic disc. This will allow the coil to tune over its mid-range and increase power output to about 5 to 6 Watts. Modula-

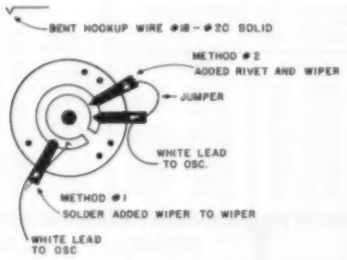

Fig. 1. Two methods of activating position 24 on the channel selector.

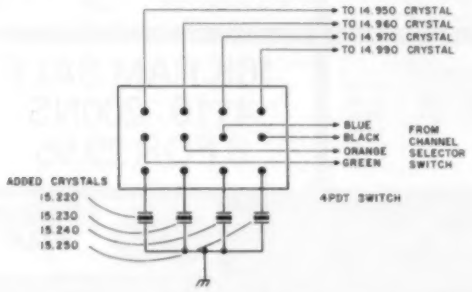

Fig. 2. Adding 24 extra channels to the Midland 13-866.

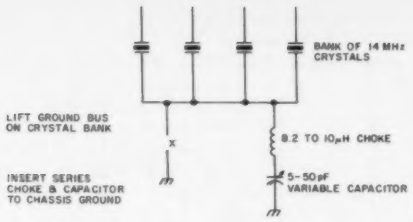
BANK OF 14 MHz CRYSTALS
LIFT GROUND BUS ON CRYSTAL BANK
X
8.2 TO 10μH CHOKE
INSERT SERIES CHOKE & CAPACITOR TO CHASSIS GROUND
5-50 pF VARIABLE CAPACITOR

Fig. 3. VXO operation with the Midland 13-866.

tion can be increased by removing TR8 from the circuit.

Adding additional channels by using a 4PDT switch is accomplished by removing the green, orange, blue, and black leads going from the selector switch to the 14-MHz crystals on the chassis. Connect these wires as diagramed in Fig. 2. With the switch down, the 24 low channels will be obtained. With the switch in the up position, the upper range can be used.

For frequencies other than, or in addition to, the normal *73* band plan, the basic conversion has a usable range of about 800 kHz without retuning.

VXO operation with this radio can be obtained by lifting the ground bus of the 14-MHz crystals and inserting a 10-uH choke and a 5-50-pF variable capacitor in series with the crystal bus to chassis ground, as in Fig. 3. This trick will work with any fundamental crystals up to about 16 MHz. Do not attempt to use it on crystals operating in the overtone mode because severe instability will result. ■

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The Nicad Conditioner

—help your nicads lose their memories

Mitchel Katz W2KPE
147-11 76th Avenue
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Quite a few nicad battery-charger circuits have appeared in print lately. However, as none of the circuits would fill my requirements, considerable research and planning was done before starting on this project. Most of the chargers described in articles were for the preferred constant-current method. Others used the constant-potential system. Still others used a combination of both. Each of the articles detailed the advantages of its method, but neglected to mention the disadvantages. Let us look briefly into each of the systems mentioned.

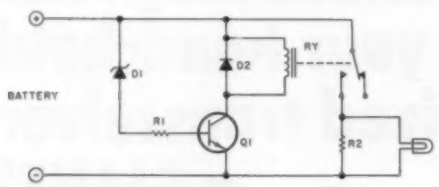

Fig. 1. Conditioner circuit.

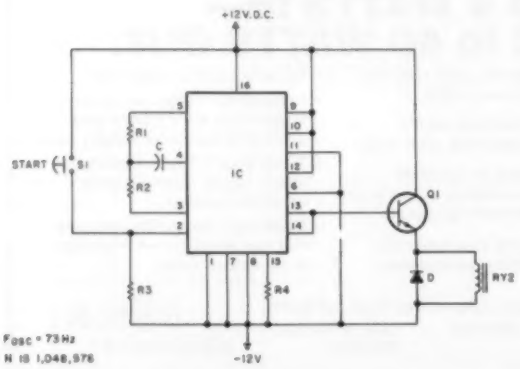

Fig. 2. Timer circuit.

Constant-current charging is usually done at the 10-hour or .1C rate (C is the rated capacity of the battery). This is fine, except that it takes from 14 to 16 hours for a full charge—an awful long time to be without your HT! Some of the newer chargers use constant-current charging at the .3C rate so that full charge can be obtained in as little as four hours. Remember that we must replace between 130% to 150% of the battery capacity due to inefficiencies in charging. This is a step in the right direction, but we must be careful about overheating as this can ruin the cells.

Constant-potential charging is definitely not recommended. With this method, the charge would start out at quite a high level, resulting in some heat being generated within the cells. As we approach the overcharge condition, additional heat will start to build up. As the battery heats up, the cell voltages will decrease somewhat, leading to even more overcharge current and greater heat buildup. This is called thermal runaway, which will eventually destroy the cells. Because of this problem, constant-potential charging is generally not recommended. The voltage cannot be set low enough to prevent thermal runaway and still fully charge the cells.

Combinations of constant-current and constant-potential systems have also been described. These systems charge the battery at perhaps the .3C or an even higher rate. A voltage sensor is provided so that when the battery reaches some predetermined level, the constant-potential method will take over. The voltage here can be set to hold additional charging current to a suitable value. One drawback to this system, however, is that cell voltages can vary with repetitive charges. It can also vary with ambient temperature. Then, of course, suppose the battery develops a shorted

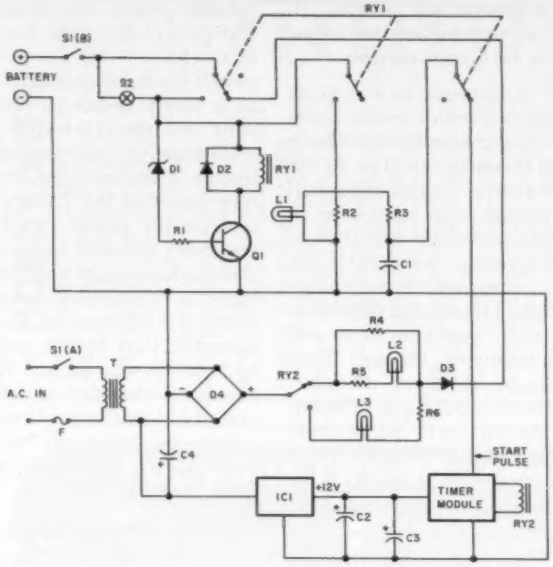

Fig. 3. Circuit for complete conditioner/charger.

cell. All of these problems mentioned will prevent the battery from reaching the sensor cutoff, so that high-rate charging can continue, eventually damaging the battery.

At this point, let me digress. Some experimenters and suppliers of chargers believe that the charge should be terminated after replacing 130% to 150% of the battery capacity. This is to prevent losing electrolyte within the cells. Others prefer the battery to remain on a trickle charge which may be as low as .01C of the battery capacity. General Electric Company's *Nickel Cadmium Battery Handbook* recommends that nicad batteries be charged at a fairly high rate, but that at completion of the normal charging period they be kept on a .1C-rate topping charge. As all cells in the battery may not have identical characteristics, the topping charge will permit the weaker cells to get a full charge without harming the other cells. G.E. goes on to say that most nicads may be left on the .1C charge rate for extended periods of time without harm.

Another item worth mentioning here is the memory effect of nicads, but since we are all probably aware of this condition by now, no discussion should be necessary.

Evolution of the Conditioner/Charger

Very few chargers described in magazine articles or that are available from the HT manufacturers take into consideration the state of charge remaining in the nicad battery. If the battery is not depleted when put into the charger, this can lead toward developing the memory effect just mentioned. To prevent this from happening, the conditioner shown in Fig. 1 was developed. This can be built as a stand-alone unit or may be incorporated into a complete charger system. Before the battery is placed on charge, it is put into the conditioner. It will immediately go into discharge at the 1C rate. When the battery voltage drops to the 1-volt-per-cell cutoff point, the relay will drop out, thereby terminating any further discharge. This procedure will not harm the battery and it will erase any memory effects.

Parts List for Fig. 1
D1—Zener diode (1 V per cells in battery)
D2—Silicon diode
R1—1000 Ohms, ½ Watt
R2—75 Ohms, 10 Watts
RY—Coil rated at less than battery voltage
Q1—Motorola HEP S0038
Lamp is type 387 in suitable holder.

Parts List for Fig. 2
IC—HEP C4058P programmable timer
Q1—HEP S0038 transistor
D—Silicon diode
RY—12-volt relay with dc coil resistance greater than 250 Ohms
R1—2700 Ohms, ¼ W
R2—6200 Ohms, ¼ W
R3—1 megohm, ¼ W
R4—10k, ¼ W
S1—Momentary contact push-button switch
C—2.2 uF, 35 V

Parts List for Fig. 3
T—Stancor P 6469, 25.2 V@1 A
F—1-A fuse
D1—Zener diode (1 V per cells in battery)
D2, 3—Silicon diodes
D4—1-A bridge rectifier
R1—1000 Ohms, ½ W
R2—75 Ohms, 10 W
R3—1000 Ohms, ½ W
R4—250 Ohms, 10 W
R5—430 Ohms, ½ W
R6—620 Ohms, ½ W
RY1—4PDT 12-volt coil (Allied Control TF 154C-C) (P and B KHU 17D11)
RY2—SPST 12-volt coil (greater than 250 Ohms)
S1—DPST toggle switch
S2—Momentary contact push-button-type switch
L1, 2, 3—Type 387 lamps in appropriate holders
C1—10 uF, 25 V
C2—4.7 uF, 35 V
C3—.47 uF, 35 V
C4—50 uF, 50 V
Q1, 2—Motorola HEP S0038
IC1—7812 regulator

Another advantage gained by this conditioning is more operating time per charge. In Fig. 1, the relay used should operate on a low current and have a coil rating somewhat lower than the battery voltage. Resistor R is chosen so that the total current drain on the battery, including the pilot light and relay, should total the Ampere-hour rating of your battery.

To describe the operation of the conditioner: When a battery which is not fully discharged and has greater than 1 volt per cell is connected, current will flow through the zener diode. This will place a positive bias on the base of the transistor, causing it to conduct. The relay is pulled in and the discharge cycle starts. When the battery voltage drops to the 1-volt-per-cell level, the zener diode stops conducting, cutting off the transistor. This causes the relay to drop out, terminating any further discharge.

The next consideration in the design of the charger was the method to be used. I wanted a constant current to charge at a fairly high rate. As it is necessary to replace about 130% of the battery capacity for a full charge, I decided to charge at the .5C rate for approximately two hours to replace 100% of the capacity. At the end of this time the charger should switch

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D-10	10	16'	22.95	18.95
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PD-4010	40,20,10/15	66'	33.95	29.95
PD-8040	80,40/15	130'	35.95	31.95
PD-4020	40,20/15	66'	29.95	25.95
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S-40	40		$10.95/pr.	

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automatically to the 1C rate to complete the charge, or for battery-topping.

Consideration was given to the control device. Some rapid-charge batteries have a thermistor built in. As the battery approaches full charge, the resistance of the thermistor will change, triggering the control device to reduce the charge rate. I found that the thermistor resistance would sometimes change. Then again, different manufacturers would use different thermistors. Sometimes they were different from battery to battery. This method, then, was discarded.

What was finally decided upon was a timer method of control. The Motorola 4058 Programmable Timer proved ideal, as it can be set for any time period desired. The circuit of the timer is shown in Fig. 2. Once the timer is triggered, the countdown begins. At the end of two hours, my timer operates, pulling in the relay for a low charge rate. This system has proven itself most reliable, with none of the defects listed for other charge-control methods. A copy of the 4058 application bulletin may be obtained by writing to Motorola, or I will send you a copy upon request and an SASE.

Fig. 3 shows the circuit of the complete conditioner/charger. Although the parts listed apply for use with my Motorola HT 220 Slimline using a 225-mAh rapid-charge battery, the same circuit can be applied to any other battery. Only a few resistors may have to be changed to vary the charging rates. The length of the high-rate charge time can be changed very easily by changing two or three jumper wires.

Several refinements were added, such as pilot lights to indicate the charger/conditioner status, discharge, high-rate charge, and low-rate charge. The power switch has been connected as a safety switch to prevent accidental battery discharge. A self-testing feature is also included. Before inserting the battery, turn on the power switch and press the start button. The discharge light and the high-rate charge indicator lamps should come on. Release the start button and both lamps will go out. If you press the start switch and the low-charge lamp comes on, shut off the power switch and then turn it on again.

Operation of the unit is extremely simple. Once you've checked the charger as described, connect it to the battery. The high-rate lamp should come on. Press the start button and the discharge lamp should come on. When the battery is down to 1 volt per cell, the high-rate charge lamp should come on again. This will now indicate that the battery is receiving its charge.

As soon as the battery goes into the charge mode, a pulse is sent to the timer to initiate the countdown. At the end of the scheduled period, the timer will pull in relay 2, shifting the charge to the low rate. High-rate charging was purposely limited to 100% return rather than 130% to prevent overheating of the cells.

This charger has now been in use for over a year, and it performs flawlessly. A fully automatic system at last! ■

References

1. *Nickel Cadmium Battery Handbook* GET 3148A, General Electric Co., Battery Business Dept., PO Box 861, Gainesville FL 32602
2. Motorola Semiconductor Products, Inc., HEP/MRO Operations, PO Box 20902, Phoenix AZ 85036. (Application bulletin HEP HN 102.)

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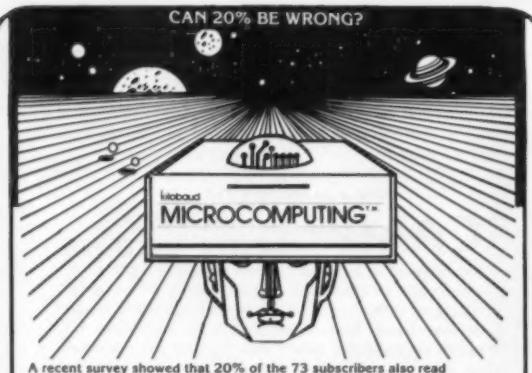

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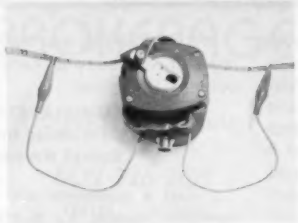

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↙Reader Service—see page 82

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458, Attn: Social Events.

MUSKEGON MI
APR 3-4

The Michigan Area Amateur Radio Council will sponsor the ARRL Michigan State Convention and Hamfest on April 3-4, 1981, at Muskegon Community College. On Friday evening, April 3rd, the "Ham Hospitality" room will be open to all at the Muskegon Holiday Inn. At 10:00 pm there will be a presentation and at midnight, an initiation. On Saturday, April 4th, doors and registration will open at 8:00 am at the college. An interesting ladies' program will be presented as well as many other events. Saturday tickets are $3.00 each, with no advance or mail ticket sales. Swap and shop table space may also be purchased on Saturday. Advanced registrations are required for the Saturday dinner program. Overnight reservations should be made directly. For additional information, write to MAARC, PO Box 691, Muskegon MI 49443, or contact Mr. Clarke Cooper K8BP, Convention Chairman, at (616)-865-6198.

ROCHESTER MN
APR 4

The Rochester Amateur Radio Club and the Rochester Repeater Society will sponsor the Rochester Area Hamfest on Saturday, April 4, 1981, at a new location, John Adams Junior High, 1525 NW 31 Street, Rochester MN. Doors will open at 8:30 am. There will be a large indoor flea market for radio and electronics items, prize raffles, refreshments, and plenty of free parking. Talk-in on 146.22/.82 (WR0AFT). For further information, contact RARC, WB0YEE, 2253 Nordic Ct. NW, Rochester MN 55901.

UPPER SADDLE RIVER NJ
APR 4

The Chestnut Ridge Radio Club will hold a ham radio and computer flea market on April 4, 1981, from 9:00 am to 3:00 pm at the Education Building, Saddle River Reformed Church, East Saddle River Road at Weiss Road, Upper Saddle River NJ. Tables will be available for $10; tailgating, $5. There is no admission fee. Food and drink will be available. For further information, contact Jack Meagher W2EHD, (201)-768-8360, or Neil Abitabilo WA2EZN, (201)-767-3575.

COLUMBIA MO
APR 4

The Central Missouri RA will present Columbia Hamfest '81 on April 4, 1981, at the Columbia Ramada Inn, Columbia MO. Admission will be $3.00 at the door and advance tickets are available for $3.00 each or 4 for $10.00. Prizes to be awarded include an Icom IC-2AT and a Kenwood TS-130S. Many commercial exhibitors will be present and a large, hard-surfaced tailgate area is available. Forums, association meetings, and XYL activities will round out the day. A banquet on Friday, April 3rd, at 7:30 pm at the Ramada Inn will feature a talk and question and answer period conducted by Mr. James Dailey, FCC Engineer-in-Charge, Midwest Region. An Icom IC-2AT will be given away at this banquet. Banquet reservations must be made in advance and the cost will be $14.00. Special group rates for overnighters will be made by the Ramada Inn. Talk-in on 146.76/.16 and 223.34/224.94. For tickets, information on reservations, available indoor flea-market space, etc., write to Columbia Hamfest '81, PO Box 283, Columbia MO 65201.

GOTEBORG SWEDEN
APR 4-5

The Goteborg Transmitting Amateurs invite all interested hams to an international ham meeting in the Swedish Trade Fair Centre, Goteborg, Sweden, on April 4-5, 1981. Featured will be a thematic stamp exhibition; lectures on VHF, UHF, and SHF; and meetings for YLs, award-hunters, and DXers. Other programs to be announced are fox-hunting, a mobile-radio contest, and a CW speed contest. A hamfest will be held on Saturday night.

PADUCAH KY
APR 5

The Paducah ARES Club will hold its 2nd annual ham/swapfest on Sunday, April 5, 1981, from 8:00 am to 5:00 pm, at the National Guard Armory, Paducah KY. There will be hourly as well as grand prize drawings. Dealers will be on hand. Talk-in on 147.66/.06 and 146.52. For additional information, contact Larry Reid AI4T, Chairman, 220 Longview Drive, Paducah KY 42001.

ST. CLAIR SHORES MI
APR 5

The South Eastern Michigan Amateur Radio Association will hold its Swap & Shop on April 5, 1981, at South Lake High School, St. Clair Shores MI. There will be a grand prize as well as hourly prizes. Ample parking will be available. For table space, write Robert Boudreau WD8RPQ, 27117 Shelbourne, Warren MI 48093, or phone (313)-754-1793.

PARAMUS NJ
APR 5

The Bergen ARA will hold a Ham Swap 'N Sell on April 5, 1981, at Bergen Community College, Paramus NJ. There are thousands of spaces available for tailgating only. Buyers are admitted free. Sellers must pay $3.00 and bring their own tables. For more information, contact Jim Greer KB2EI, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

WEYMOUTH MA
APR 11

The South Shore Repeater Association will hold its fifth annual ham auction on April 11, 1981, at Central Junior High School, Broad Street, Weymouth MA. Check-in begins at 8:00 am and the auction starts at 12:00 noon. There will be a raffle with a Yaesu FT-207R HT as the grand prize, as well as many other small prizes during the auction. The winner need not be present to receive the grand prize. Minimum bids of 15% are allowed. Talk-in on 147.90/.30.

KANSAS CITY MO
APR 11-12

The PHD Amateur Radio Assn., Inc., will sponsor the 12th annual Northwest Missouri Hamfest and Missouri State ARRL Convention on Saturday and Sunday, April 11-12, 1981, at the Kansas City Trade Mart, Kansas City MO, from 9:30 am to 5:30 pm. The 1981 directory of all amateurs in the 20-county metropolitan Kansas City, Missouri/Kansas area will be on sale at the hamfest. Display booth spaces are available at a minimal cost of $40.00 for a single 10 × 12 booth, which includes 4 passes, security, electric hookups if needed, tables, chairs, and free parking. For an additional fee of $20.00, extra space (10 × 12) is available. Displays may be set up from

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8:00 pm to 10:00 pm on Friday, April 10th, and from 7:00 am on Saturday, April 11th. For further information, contact L. Charles Miller WA0KUH, 7000 NE 120th, Kansas City MO 64166, (816)-781-7313, or Thomas L. Bishop K0TLM, 4936 N. Kansas, Kansas City MO 64119, (913)-342-4939.

FRAMINGHAM MA
APR 12

The Framingham Amateur Radio Association will hold its annual spring flea market on Sunday, April 12, 1981, at the Framingham Police Station drill shed, Framingham MA. Doors will open at 9:00 am and admission is $1.00. Sellers' tables are $7.00 in advance and $8.00 at the door. Talk-in on .75/.15 and .52. For more information or seller pre-registration, contact Ron Egalka K1YHM, 3 Driscoll Drive, Framingham MA 01701, or phone (617)-877-4520.

RALEIGH NC
APR 12

The Raleigh Amateur Radio Society is sponsoring its ninth annual hamfest on Sunday, April 12, 1981, at the Crabtree Valley Mall, US 70 West, Raleigh NC. Activities begin at 9:00 am. General admission is $3.50. There will be many prizes, including a first-prize choice of a Kenwood TS-130S HF transceiver and PS-30 12-volt power supply or an IC-251A multi-mode 2-meter transceiver with Mirage B-108 80-Watt amplifier. Second prize is a triband beam; third prize is a heavy-duty CDE rotor. The drawings will be held all day Sunday. A covered flea market will also be featured. There will be a hospitality room from 7:00 pm to 11:00 pm on Saturday. Talk-in on WR4ACF 146.04/146.64 and WR4AOE 146.28/146.88. For additional information or reservations, write to RARS Hamfest, PO Box 17124, Raleigh NC 27619.

WELLESLEY MA
APR 18

The Wellesley Amateur Radio Society will hold its annual auction on Saturday, April 18, 1981, beginning at 11:00 am, at the Wellesley High School Cafeteria, Rice Street, Wellesley MA. Doors will open at 10:00 am. Talk-in on .60/.03, .04/.64, and .52. For further information, contact Kevin P. Kelly WA1YHV, 7 Lawnwood Place, Charlestown MA 02129.

WAUKEGAN IL
APR 18

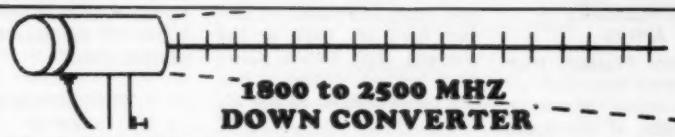
The Civil Air Patrol, Waukegan Squadron, will hold its first annual Spring Hamfest on April 18, 1981, from 0700 to 1700, at the Lake County Fairgrounds, IL Rte. 20 and US Rte. 45, Waukegan IL. The donation is $2.00 and tables are $1.50 on a first-come basis. Features will include a large indoor flea market, refreshments, and free parking. Talk-in on 146.94. For more information, call (312)-244-2134, or send an SASE to W9NXR, 637 Emerald, Mundelein IL 60060.

DAYTON OH
APR 24

The 12th annual B•A•S•H will be held on Friday night of the Dayton Hamvention, April 24, 1981, at the convention center, Main and Fifth Streets, Dayton OH. Parking is available in adjacent city garage. Admission is free to all. Sandwiches, snacks, and a COD bar will be available. Live entertainment will be provided. Awards include a new synthesized HT. For further information, contact the Miami Valley FM Association, PO Box 263, Dayton OH 45401.

SPOKANE WA
APR 25

The Inland Empire Amateur Clubs will sponsor a swapfest at the Floral Building at the Spokane Interstate Fairgrounds, Spokane WA, on Saturday, April 25, 1981, beginning at 9:00 am.



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✓ Reader Service—see page 82

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MOUNT PLEASANT TX
APR 25

The Mount Pleasant High School Amateur Radio Club will sponsor an indoor swapfest on April 25, 1981, at the Mount Pleasant High School campus, Mount Pleasant TX. Doors will be open from 7:00 am to 3:00 pm. Admission is free and table space is $3.00. Door prizes will be awarded. Talk-in on 146.34/.94. For further information, contact Scott Redfearn N5BQG, Box 105, Mount Pleasant TX 75455.

AMBOY IL
APR 26

The Rock River Amateur Radio Club will hold its 15th annual hamfest on April 26, 1981, at the Lee County 4H Center in Amboy IL, one mile east of the junction of Rtes. 52 and 30, 10 miles south of Dixon IL. There will be free coffee and donuts starting at 8:00 am. Camping space will be available at a nominal charge. Six-foot display tables are $5.00 each and tickets are $1.50 in advance, $2.00 at the gate. Talk-in on .37/.97 and .52. For full details, contact Charles (Chuck) Randall W9LDU, 1414 Ann Avenue, Dixon IL 61021, or phone (815)-284-6380.

NEWTON MA
APR 26

The Middlesex Amateur Radio Club will hold its first annual indoor flea market on Sunday, April 26, 1981, at the Wayland High School Commons building, located on Rte. 126, between Rtes. 30 and 20, Wayland MA, from 10:00 am to 4:00 pm. Admission is $1.00 at the door and ample off-street parking is available. Advance reservations for tables are $6.00 each and at the door $7.50 each on a first-come-first-served basis. The doors will open at 9:00 am for setups. Talk-in on 147.96/.36 and 146.52. For table reservations, contact Irving Geller WA1CDW, Apt. 8422A, 1450 Worcester Road, Framingham MA 01701.

JACKSON MS
APR 26-27

The Jackson Amateur Radio Club will host the ARRL Mississippi State Convention from 12:00 noon to 5:00 pm on April 26, 1981, and from 8:00 am to 2:00 pm on April 27, 1981, at the Raymond Road National Guard Armory, off Interstate 20, Jackson MS. Activities will include dealers, forums, a flea market, prizes, and YL prizes. Admission is free. Swap tables will be $5.00 each day. Talk-in on 146.16/.76, 146.52, and 3987.5. Food will be available at the site on both days. A banquet will be held Saturday night at the Holiday Inn-Southwest. Please make reservations for both the swap tables and the banquet in advance. For more information, contact Nita Stone N5AGV, Rte. 1, Box 157, Brandon MS 39042, (601)-825-2060.

WOODBRIDGE NJ
MAY 2

The DeVry Technical Institute Amateur Radio Club (WA2MDT) will hold its fifth annual amateur radio and computer flea market on May 2, 1981, at DeVry Technical Institute, 479 Green Street, Woodbridge NJ. The flea market will begin at 9:00 am and for those who wish to set up tables, a fee of $3.00 will be charged. Talk-in on 146.520 beginning at 8:00 am. For further information, call Frank Koempel WB2JKU at 634-3460 or Steve Hajducek KA2IFX at 727-5962.

MEADVILLE PA
MAY 2

The seventh annual Northwestern Pennsylvania Hamfest will be held on May 2, 1981, at the Crawford County Fairgrounds, Meadville PA. The gates will open at 8:00 am. Admission is $3.00; children under 12 will be admitted free. Indoor table spaces are $5.00 per space and outdoor car spaces are $2.00. Bring your own tables. Refreshments will be available. Commercial displays are welcome. Talk-in on .04/.64, .81/.21, and .63/.03. For information, write CARS, PO Box 653, Meadville PA 16335, Attention: Hamfest Committee.

GRAY TN
MAY 2-3

The Bristol Amateur Radio Club, the Johnson City Amateur Radio Association, and the Kingsport Amateur Radio Club will hold their first annual Tri-Cities Hamfest on May 2-3, 1981, at the Appalachian Fairgrounds, north of Johnson City (off Highway 137), Gray TN, from 9:00 am to 5:00 pm on Saturday and from 8:00 am to 4:00 pm on Sunday. The dealer space charge at the door is $30.00 for the weekend for a 10 × 12 space. The advance reservation charge is $25.00 and must be received by April 1, 1981. The dealer charge also includes security and admission for five employees. There are approximately 40 RV spaces with complete hookups renting for $5.00 per night inside the fairgrounds. Motels are available nearby. Dealers can set up anytime after Friday noon or after 6:00 am Saturday and Sunday. Advance reservations or further information can be obtained by writing Mary S. Biggs KA4EXP, Secretary-Treasurer, Tri-Cities Hamfest, PO Box 3682 CRS, Johnson City TN 37601, or phoning either (615)-928-1818 or (615)-282-1711-x380.

GREENVILLE SC
MAY 2-3

The Blue Ridge Amateur Radio Society will hold its annual hamfest on May 2-3, 1981, at the American Legion Fairgrounds, Highway 25 bypass, Greenville SC. On Saturday, FCC exams will be given at Greenville Tech from 10:00 am till 3:00 pm. Other features will include dealer exhibits, inside flea markets, chicken/pork plates, prizes, overnight RV parking, and motel rooms available at the Ramada Inn (1-800-228-2000).

PENNS PARK PA
MAY 3

The Warminster Amateur Radio Club will hold the 7th annual Ham-Mart on Sunday, May 3, 1981, from 9:00 am to 4:00 pm (rain or shine) at a new location, Middleton Grange Fairgrounds, just minutes from I-95 or the Pennsylvania Turnpike on Penns Park Road, Penns Park PA. Featured will be door prizes, plus a grand prize to be drawn at 3:00 pm, a flea market, a free FM Clinic, and an auction. There will be refreshments, rest rooms, and shelter available. Registration is $3.00 per person, which includes one ticket for door prizes. YLs, XYLs, and children under 14 will be admitted free. Seller (tailgater) spaces are $2.00 (with tables available). Talk-in on 146.52 or WARC 147.69/.09. For additional information, write WARC, PO Box 113, Warminster PA 18974, or call Mark Hinkel WA3QVU at (215)-657-7295.

HAM HELP

I'm looking for any information about a typewriter, a Singer Flexowriter type 2309, manufactured by the Business Machines Division in the mid 60s. The typewriter has tape punch and tabulate options.

I need especially information on how to interface the typewriter to a Z-80-based microprocessor system, electrical and logical diagrams of the typewriter, or the postal address of the Singer Company. I'm ready to bear the expenses for copies and for mailing. Thank you very much for any help.

Dominikus Maisl DF5TQ
Wehrstrasse 37
7320 Goeppingen
Federal Republic of Germany

I am in need of a schematic diagram and operating manual for an Elco model 425 oscilloscope, produced in the 1950s. I'll be glad to pay copying costs. Thank you.

Ed Danielczyk K9SXU
9 Lloyd St.
Cary IL 60013

I'm looking for information on the replacement of the 7360 balanced modulator in a Yaesu FTDX-560 with solid-state unit. This is due to the current price here of $26 (Australian) for the tube. Thank you.

David B. Simpson VK4VHR
PO Box 2311
Mount Isa 4825
Queensland, Australia

CONTESTS

from page 14

only once for each team. When DX/WK partners contact each other it counts as a double multiplier. Final score is the sum of QSO points times the total multiplier.

AWARDS:

Extraordinary certificates will be issued to the highest individual score, DX/WK teams, YL/OM teams, and score for highest single operator category. Regular certificates to the highest state, country, and Canadian province winners.

ENTRIES:

Logs must show date/time (GMT), RS, SSBer number, partner's call, mode of operation, a band, and period of rest time. Summary sheets show number of states, Canadian provinces, countries, YL/OM teams, DX/WK teams, and partner contacts. All entries must be postmarked by May 15th.

Any member desiring to enter the DX/WK team category should immediately send request to: Lyle F. Shaw KC4LF, 6329 Fairway Blvd., Apollo Beach FL 33570. For record purposes, requests should be made in writing. In the week preceding the QSO party, members wishing a partner may request one through system controls on SSBers daily systems. No team assignments will be made after the party begins.

YL/OM teams are self-evident in their operation and need not file. Single-operator category members are eligible unless entered with teams. Non-members enter single op *only!* DX/WK teams consists of a DX and WK member. The team score is the sum of both partners. Score to be determined when both logs are received. When only one log is received, credit will be given as a single operator. YL/OM teams consist of one YL member and one OM member who are related: husband/wife, father/daughter, mother/son, brother/sister. Operation must be from the same QTH, using the rig with his/her own call.

HELVETIA CONTEST
1500 GMT April 25 to 1500 GMT April 26

Use all bands, 1.8 to 28 MHz, on CW or phone. Each station can be worked once per band regardless of mode.

EXCHANGE:

RS(T) plus three-figure serial number starting at 001. Swiss stations will also give their canton.

SCORING:

Each contact with an HB station counts 3 points. The multiplier is the sum of Swiss cantons worked on each band, 26 maximum per band. Final score is sum of QSO points multiplied by the sum of cantons worked on each band.

ENTRIES AND AWARDS:

Certificates will be given to the highest scorer in each country. USA and Canadian call areas are considered as separate countries. Logs must be postmarked not later than 30 days after the contest and sent to: TM USKA K. Bindschedler HB9MX, Strahleggweg 28, 8400 Winterthur, Switzerland.

Canton abbreviations are: ZH, BE, LU, UR, SZ, OW, NW, GL, ZG, FR, SO, BS, BL, SH, AR, AI, SG, GR, AG, TG, TI, VD, VS, NE, GE, and JU.

H26 Award—for contacts made after January 1, 1979: Send a list and QSL for each of the 26 cantons worked on CW and/or phone, RTTY, and SSTV to: Walter Blattner, Postbox 450, Locarno 6601 Switzerland.

RESULTS

1980 SARTG WORLDWIDE RTTY CONTEST

Single Operator—Class A

I3FUE	350,900
I7FKO	278,760
SM6ASD	215,670
W3FV	215,040
G3HJC	195,500

Multi Operator—Class B

I5MYL	324,360
OE9ERI	244,720
G3UUP	210,540
OK3KFF	137,550
OH2ZY	128,040

Shortwave Listeners—Class C

G8IZD	227,525
H. Ballenberger	164,755
Y2-2814/M	140,400
G8CDW	96,960
K. Wustner	86,790

RESULTS

1980 CAN-AM CONTEST

Trophy Winners

Canadian Combined Champion: John Sluymer CZ8OU
American Combined Champion: David Hachadorian K6LL/7
Canadian Phone Trophy: Doug Freestone XJ5UF
American Phone Trophy: Jack Webb W5JW
Canadian CW Trophy: Graham Williams VE2WA
American CW Trophy: Trey Garlough WN4KKZ
Canadian Multi-Op Champion: Prince George CC VE7ZZZ
American Multi-Op Champion: Stan Griffiths W7NI
Club Competition: The Other Club (Wash., B.C.)

HAM HELP

Three years ago, you published a letter from us asking for hospitality on our visit to California. Thanks to you, we made many new friends and had a marvelous time.

We plan another visit to the U.S. this August and want to spend a few days in Washington DC, where we don't know anyone. If any family can offer hospitality for 3 to 4 days, we would be glad to reciprocate and offer our home for a visit.

We are an easygoing, adaptable couple in our mid-thirties who enjoy meeting people and dislike formal hotels. Michael is an electronics engineer, a ham, and a pilot. I am a children's nurse.

We live in a beautiful and historic part of England, about 2 hours from Edinburgh and the Lakes District, and about 3 hours by train from London. We love visitors and meeting people, so I am sure this vacation will be as great as our last.

Pat and Michael Stott
"Wellview"
12 Castle View, Ovingham
England NE42 6AT

I heard from a friend that there was a Dungeons and Dragons net on 20 or 40 meters and I would appreciate any info on this. Thanks.

Al Fogleson KA8HFS
1654 Dyson
Muskegon MI 49442

I'm searching for a Collins 32S1 transmitter in any condition that is not being used and is cheap. State condition and price.

H.F. Schnur
115 Intercept Ave.
North Charleston SC 29405

I'm looking for a Collins KWM-2-to-KWM-2A conversion kit, Collins main tuning knob (553-5787-003), and quad antenna spreaders.

Hobie Steele
Rte. 3, Box 273
Cambridge MD 21613
(301)-228-7595

FUN!

from page 34

6) Soviet jamming stations, intent on keeping "undesirable" broadcasts from being received in their country, legally identify themselves on CW. ____ ____
7) Radio Berlin International operates from West Berlin. ____ ____
8) The Voice of America is prohibited by Congress from broadcasting in any language but English. ____ ____
9) There is a shortwave broadcast band allocated at 11 meters. ____ ____
10) Radio Peace and Progress is a Soviet shortwave station. ____ ____
11) "Suomen Yleisradio" broadcasts from Samoa. ____ ____
12) SINPO is an acronym for the Special InterNational Programming Organization. ____ ____
13) "The Graveyard" is the SWL's nickname for 40-meters. ____ ____
14) In many countries, you have to be an SWL before you can become a ham. ____ ____
15) The *International Frequency List* is a publication listing in five volumes *all* of the world's radio stations. ____ ____
16) The "Worldwide TV-FM DX Association" is an organization specializing in VHF-UHF SWLing. ____ ____
17) Some countries require SWLs to license their receivers. ____ ____
18) WCC in Chatham MA, broadcasts news reports, in CW, on 6.376 MHz. ____ ____
19) Many ship stations have the same type of four-letter callsigns as broadcast stations, e.g., KXXX. ____ ____
The U.S. AM broadcast band has only 23 channels. ____ ____

ELEMENT 5—HAM ACROSTIC

Guess the words defined and write them over the numbered dashes. Next, place each letter in the correct square in the puzzle. The black squares show word endings. The completed puzzle will form a statement relating to shortwave listening. (Illustration 2)

A) Medium-wave antenna..... $\overline{28}$ $\overline{50}$ $\overline{42}$ $\overline{51}$
B) "The East is Red"..... $\overline{65}$ $\overline{9}$ $\overline{41}$ $\overline{2}$ $\overline{67}$
C) A shortwave station's "tongue"..... $\overline{5}$ $\overline{13}$ $\overline{36}$ $\overline{8}$ $\overline{48}$ $\overline{16}$ $\overline{17}$ $\overline{46}$
D) Jammers produce this..... $\overline{59}$ $\overline{18}$ $\overline{4}$ $\overline{15}$ $\overline{31}$
E) Old-style receiver component. $\overline{62}$ $\overline{58}$ $\overline{60}$ $\overline{12}$
F) Effect of Radio Moscow report about Soviet farming on listeners..... $\overline{19}$ $\overline{27}$ $\overline{32}$ $\overline{64}$
G) Element missing from Radio Moscow's news programs.... $\overline{10}$ $\overline{14}$ $\overline{1}$ $\overline{33}$ $\overline{63}$
H) Famous army radio station... $\overline{53}$ $\overline{35}$ $\overline{49}$
I) Woodpecker's alleged purpose..... $\overline{55}$ $\overline{24}$ $\overline{25}$ $\overline{39}$ $\overline{38}$
J) SWLs throw this when a rare station is QRMed..... $\overline{43}$ $\overline{66}$ $\overline{3}$
K) Engineering society..... $\overline{29}$ $\overline{54}$ $\overline{6}$ $\overline{45}$
L) What Germans call East Germany..... $\overline{37}$ $\overline{40}$ $\overline{57}$
M) Spanish "I"..... $\overline{61}$ $\overline{20}$
N) Iraq amateur prefix..... $\overline{11}$ $\overline{26}$
O) Number of megahertz in SWL 90-meter band..... $\overline{21}$ $\overline{22}$ $\overline{23}$ $\overline{56}$ $\overline{47}$
P) RTTY press station's test letters..... $\overline{44}$ $\overline{34}$
Q) Your author's former call suffix $\overline{7}$ $\overline{30}$ $\overline{52}$

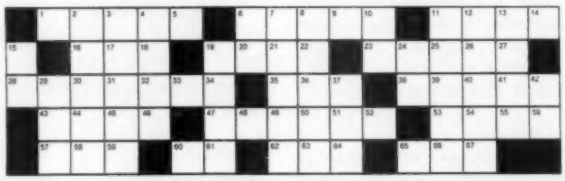


Illustration 2.

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1-J, 2-S, 3-P, 4-F, 5-M, 6-I, 7-U, 8-R, 9-A, 10-T, 11-N, 12-B, 13-O, 14-D, 15-L, 16-G, 17-Q, 18-C, 19-E, 20-H.

Element 3:
(Reading from left to right) utilities, broadcast, tropicals, clandestine; band, domestic, program, listen; music, religious, interval, language; government, propaganda, engineer, overseas; calibrate, foreign, relay, static.

R	A	D	I	O	M	O	S	C	O	W	S	
A	M	■	T	■	E	■	W	■	C	■	O	
D	■	S	A	I	D	■	A	N	T	■	U	
I	N	T	L	■	I	O	N	O	■	■	T	
O	■	■	Y	O	U	■	■	W	R	T	H	
L	O	S	S	■	M	■	S	■	P	■	A	
I	■	R	■	■	W	A	T	E	R	■	M	
B	C	I	■	C	A	■	A	■	■	■	E	
E	■	■	W	W	V	■	T	O	W	E	R	
R	X	■	O	■	E	■	I	B	A	■	I	
T	■	G	R	■	■	C	O	■	N	■	C	
Y	A	N	K	E	E	■	N	E	T	■	A	

Illustration 1A.

Element 4:

1) True—In a series of experimental transmissions during November, 1980. More SSTV broadcasts may take place this year.
2) True—Aren't they thoughtful!
3) False—WYFR and KGEI, among others, are privately owned.
4) False—They're commercial stations transmitting business or safety traffic.
5) True—Radio energy from the giant planet can be detected at those frequencies with the proper receiving gear.
6) True—Ironic, isn't it?
7) False—East Berlin.
8) False—Like most international broadcasters, the VOA transmits in dozens of languages.
9) True—25.600-26.100 MHz. Just below you-know-what.
10) True—Peacefully progressing toward what?
11) False—It's Finnish for Radio Finland.
12) False—It's a reception report form, similar to the amateur RST system. The letters stand for: Signal, Interference, Noise, Propagation, and Overall merit.
13) False—It's the term applied to the upper end of the U.S. AM broadcast band where many low-powered stations are grouped.
14) True—This is especially true in many eastern European countries where SWLs must obtain a certain number of amateur QSLs before they're allowed to transmit. So answer those SWL QSLs!
15) False—Amateur, maritime, experimental, and a few other types of stations aren't listed, but just about everyone else is. The ITU publishes it.
16) True—You can write them at PO Box 97, Calumet City IL 60409.
17) True—As a matter of fact, most countries slap a fee on radios and TVs—a way of raising revenues to subsidize government broadcasting.
18) True—Great code practice.
19) True—Confusing, isn't it?
20) False—One hundred and seven channels, but more are on the way as soon as the FCC can add more by pushing existing stations closer together.

Element 5:

See Illustration 2A.

	U	N	T	I	L		E	I	G	H	T		Y	E	A	R			
S		A	G	O		B	O	T	H		R	A	D	I	O				
L	I	B	E	R	T	Y		A	N	D		R	A	D	I	O			
	F	R	E	E		E	U	R	O	P	E		W	E	R	E			
	R	U	N		B	Y		T	H	E		C	I	A					

Illustration 2A.

SCORING

Element 1:

Twenty points for the completed puzzle, or 1/2 point for each question correctly answered.

Element 2:

One point for each station you matched to its QTH.

Element 3:

One point for each word unscrambled.

Element 4:

One point for each correct answer.

Element 5:

One point for each correct definition. Give yourself 10 extra points if you deciphered the message.

Rate your SWL skills as follows:

1-20 —You listen to shortwave on a radio purchased from a sidewalk vendor. Can sometimes hear Radio Moscow.
21-40 —You write weekly letters to "DX Mailbag" and are deeply thrilled when you hear your name announced on the air.
41-60 —You monitor Radio Warsaw while working Novices on 40.
61-80 —You log countries by the dozen and are the object of extreme envy from your peers.
80-100 + —A real pro. You're probably interviewed by Dan Rather for your interpretation of foreign broadcasts during world crises.

Next month: ARRL

HAM HELP

I am trying to locate Icom 22As, 215s, or similar radios—in working condition—that can operate just above and just below 2 meters (for MARS and similar applications).

Jim McCallum WB6INJ
10051 Perdido St.
Anaheim CA 92804

I need some help learning to speak Nynorsk, the "other language" spoken in Norway. I have some books and can get along fairly well in Riksmaal, and now it's time to learn Nynorsk.

Perhaps there are amateurs living in the USA who speak this language or one of its dialects. I would like to arrange a weekly sked on 75 or 40 SSB to help get this pronunciation straight—not to mention the grammar. Drop me a line and we'll work up a sked.

Tusin takk og paa gjensyn!

Nils R. Bull Young WB8IJN
920 Greenheart Drive
New Carlisle OH 45344

I need the manuals for and any details on converting the Heathkit HW-29A and Lafayette HE45a 6m rigs to FM. I would also like to convert a Gonset IV to FM. I will pay for all expense of copying and mailing.

Richard McCubbin
535 Church St.
Portland MI 48875

My hobby is listening to shortwave radio and DXing. I need help because I recently purchased a used Hallicrafters model SX-110 receiver, but have been unable to obtain an operator's manual. If anyone has an operator's manual, please contact me. Thank you.

Edward L. Gafford
221 Royer Court
Louisville KY 40206

I am interested in hearing from Field Day 2 owners about what kind of results the unit gives with less than perfect code, sloppy code, QSB, QRM, etc.

Berand Kirschner WB6YCQ
4439 Jupiter Drive
Riverside CA 92505

I am looking for a crystal-controlled CB rig which has 4 to 6 or more channels and separate crystals for transmit and receive, in LA or Orange counties.

Al Gordon
1726 Spreckels Lane
Redondo Beach CA 90278
(213)-372-8560

I need information and a service manual for the Heathkit® DX-100 transmitter, and would also like to know of any modifications done on the rig. I'll pay for copying. Thanks.

John S. Lee KA4EPR
17401 NW 20 Ave.
Miami FL 33055

I'm looking for information on a Northern Radio Company, Inc., F.S. diversity converter, circa 1956. It is a type 174, model 1, serial 180. I believe that this is a terminal unit for RTTY, has a variable frequency shift, and was used in the Air Force. I would really appreciate any help on this.

Gary L. Young N3ALL
Box 129
Wise's Grove Road
New Brighton PA 15066

Does anyone have any information on building test and calibration equipment for the 2-4 and 3.7-4.2-GHz ranges? Also, what would be the lowest possible cost?

Lamar Evans II
Rte. 1, Box 87C
Anacoco LA 71403

LEAKY LINES

from page 18

proper examination. Why propose quantitative growth while running the real risk of a reduction in quality?

Why should the back door be opened for unqualified persons to slip through and get amateur privileges? No one stops anybody from becoming an amateur. Why should a special route be opened for those who are unwilling to exert enough effort to earn the privilege?

And although the ARRL appears to be viewing the matter from the position that it will act in accordance with the wishes of the membership, it is very clear that in raising uncertainty about it at all, instead of opposing it from the outset, it is placing ham radio in possible jeopardy. By expressing unqualified opposition at once, the League would have served notice that it believes the Commission grievously wrong. And it is about time that someone stood up to the FCC for a change. Many FCC proposals in recent years have shown rather clearly that the Commission is not overly impressed with the necessity of safeguarding the continued existence of amateur radio, at least not as we have known it.

I believe that the digital licensing proposal is one of the most dangerous ever made, and I exhort all amateurs to ponder well what it can mean in terms of the survival of our hobby. It must be resoundingly opposed, and ARRL directors must be made aware that their constituents are solidly against it. Our League must take a position consistent with the wishes of its membership, for if it fails to do this, it no longer deserves to be considered the leading representative body in ham radio.

AWARDS

from page 44

tor Service, and radio communications throughout Australia in general. Today, thanks largely to the efforts of John Flynn, every cattle station and settlement in the Australian outback has radio communications.

Flynn spent his whole working life in the outback helping others, no matter what nationality or color. Last year was the 100th year since the birth of John Flynn, and the Alice Springs Community College Radio Club had 2,000 certificates printed in memory of this great man.

Amateur operators worldwide are encouraged to participate in recognizing the achievements of such a radio pioneer.

To qualify, all VK stations must make three contacts with Alice Springs club members; all other stations of the world must log at least two contacts with Alice Springs club members. The award is also available to SWL stations who can log at least 3 station contacts heard. There are no band or mode restrictions for the award. Listen for VK8s.

To apply, have your contacts with the VK8s of the Alice Springs club verified by at least two radio amateurs or a local club secretary. Keep in mind that the same station may be worked more than once if the contacts are separated by 24 hours.

Enclose your application along with a donation of $3.00 to the Awards Manager. All funds generated by this award will be given to charity. Send your application to: ASCCRC Awards Manager, PO Box 2953, Alice Springs, Northern Territory, Australia 5750.

VK8 OUTBACK AUSTRALIAN AWARD

My thanks goes to Laurie Day VK8LD for forwarding the latest details about the very popular VK8 Outback Australian Award.

To qualify for the award, applicants must make contacts with members of the Alice Springs Community College Radio Club. VK stations and SWLs must contact at least 6 club members; all others must make a minimum of 3 club member contacts. To be valid, all contacts must have been made after December 1, 1979. There are no band or mode restrictions.

A list of club members can be obtained by sending your request with 3 IRCs or $1.00. Fees for the award are: $2.00 for VKs; $2.50 for DX stations. Forward your list of contacts, verified by two fellow amateurs, to The Awards Manager, VK8 Outback Australian Award, PO Box 2953, Alice Springs, Northern Territory, Australia 5750.

HAMVENTION STATION

WD8EOL and W8ILC have informed us that special-event station W8BI will be operating from the Dayton Amateur Radio Association's communications van on Hamvention days, April 24, 25, and 26, 1981. Special Dayton Hamvention certificates will be sent to anyone contacting W8BI who sends a large stamped envelope. Send QSL to W8BI (special event station), P.O. Box 44, Dayton OH 45401. Frequencies: 14.295, 7.230, and 7.125 (CW). Times: Friday, April 24, 1800—2200 UTC; Saturday, April 25, 1400—2200 UTC; and Sunday, April 26, 1400—1800 UTC.

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 8

Like anything else, if you are going to make money at gambling you should know more than the information you get in *Reader's Digest*. The fact is that there are a number of very good books on the subject of gambling... and on how to win. The further fact is that if you know how to gamble and have some experience, you can win consistently. I'm not just talking about counting the cards at 21, which is old hat by now... I'm talking about craps.

Not having done my homework... and not really having much time... I avoided the gambling this trip.

CES has nothing whatever for the ham business. It is mostly involved with things like hi-fi, car stereo, calculators, digital watches, radar detectors, television sets, VTRs, and dirty-movie video cassettes. They had one whole room devoted to porno cassettes!

There were a few microcomputer exhibits... such as the new H-P personal computer system, the new color Commodore system, T.I., Atari, Mattel, Bally, NEC, Casio, Panasonic, Quasar, APF... etc. Apple wasn't there, but I did run into Steve Jobs, who recently became a multimillionaire when the Apple stock went on the market. Every

DXPEDITION CALENDAR

To better serve our readers we are considering beginning a DXpedition Calendar. If you are interested in having your operation included in this listing, please include locations, dates, callsigns, frequencies, operating hours, QSL info, etc., along with the name of a person to contact if there are any questions about the operation.

Please send your DXpedition info to Editorial Offices, *73 Magazine*, Pine Street, Peterborough NH 03458, attention: DX Calendar.

NET OPERATIONS

We would like to accumulate a list of active nets and their purposes for a possible directory. If you are interested in having your net operation listed, type or print (neatly) its particulars (purpose, dates, frequencies, etc.) along with the name of someone to contact should there be any questions. Depending on the response, a very comprehensive special-interest directory could result.

If you would like to participate, write to Editorial Offices, *73 Magazine*, Pine Street, Peterborough NH 03458, attention: Net Operations.

HAM LICENSE CLASSES

If you or your club are giving or planning to give code and theory classes, please let us know. Include dates of each session, license classes taught, and the name of someone to contact for complete information. With this, we can perhaps direct an aspiring amateur to a nearby class. More than one ham has been asked about helping a beginner or a ham who wishes to upgrade and was unaware that the club across town was having classes.

If you would like to have your classes listed, please write to Editorial Offices, *73 Magazine*, Pine Street, Peterborough NH 03458, attention: License Classes.

time the Apple stock drops one point he loses about $5 million...how'd you like to be in that position?

A lot of the consumer electronics magazines were there. I got to see a recent issue of *S-9* ...now shrunk to 72 pages, with just 12 pages of advertising ...even thinner than *onComputing*, with its 15 pages of ads. *CB Magazine* is really looking good, with its increased ham orientation...thus encouraging CBers to move on into hamming. Gordon West, the *CB* editor, has rebounded well after his experience with the ARRL. Apparently the shafting was discussed at length at SAROC.

WEST QUESTIONS

Since a lot of amateurs get all bent out of shape at any mention of the League, let's steer clear of that organization entirely. Besides, I'm really sick of hearing the old saw that I am anti-League. I'm anti the bad guys, no matter where they are ...in Washington, Newington, or Oregon.

Now, to cases. Gordon West, the editor of *CB Magazine*, recently ran for office in a national club and was refused the right at the last moment to have his votes counted by that club's general manager. Attempts at getting a rational explanation of this weird and seemingly dictatorial move have so far been frustrated. Please then consider this a general call: If anyone in the readership of this magazine knows the real reason for this move, please write it up so it can be published. Please send this information to all ham magazines and let's see which have the guts to print the facts.

HAM HELP

I am in need of a service manual on military transmitter T368D/URT. I will copy and return or possibly purchase outright. Thank you.

A. K. Seput KA2AYS
258 Hillside Avenue
Palisades Park NJ 07650
(201)-461-9169 after 7:00 pm

Can anyone help me locate information on a Harrison Laboratories model 510 regulated power supply (0-36 V, 10 A)? A manual or schematic would help and I will gladly pay for reproduction costs. Many Thanks.

James O. Dickinson W4LLF
1408 Monmouth Court West
Richmond VA 23233

I need a manual for an Eico capacitance meter, model 955. I'll pay for photocopying or will copy and pay postage both ways. I also need a power transformer and/or schematic showing power transformer for a Hallicrafters SX-9 receiver. State cost of transformer in first letter, please. All letters or calls answered. Call collect.

Ernest C. Wankowski KB5OJ
5510B Follett Road
Fort Sill OK 73503
(405)-248-6630 after 1800 CST

I need a copy of the manual for the National NCX-3—an original or photocopy would be fine. I'll pay costs.

W. Dennis W1WA
Box 1103
Marblehead MA 01945

All Armenian amateur radio operators interested in getting together on the ARARAT Net, please contact me for sked and information.

Stefan Karadian N8BGD
7127 Brookridge Drive
West Bloomfield MI 48033

Wanted are any of the Collins speakers, models 312A-1, 312B-1, or 270G-3, along with a Collins gear-reduction knob like that used on the 75A series of receivers and KWS-1 transmitters. Also desperately wanted is a copy of the instruction and/or service manual for a Roberts 770X tape recorder. Will pay cash to have manual copied or would take a used book with all pages. Many thanks.

Ciano R. E. Strachan C6ANI
PO Box N4106
Nassau NP, Bahamas

I need operating manual number TM11-5820-358-10 for the R390A military receiver. I will pay for copies or pay postage both ways. Thank you very much.

Harold Sherven KA9BPS
951 Christina Court
Plainfield IN 46168

I need information and a schematic for a Golden Falcon model 150 power amplifier. I need to know frequency ranges and any other information.

E. L. Sandefur N6DSZ
17711 Van Buren St., #E
Huntington Beach CA 92647

Is there anyone out there who can lend or copy the circuit diagram and other info for a model 830 oscilloscope-wobbulator made by Triumph Manufacturing Co., Chicago, Illinois (1950 or earlier)? Thanks.

Ladd Sajor W2KGV
767 Lomas Street
Port St. Lucie FL 33452

I am looking for schematic diagrams for the following radios: E.F. Johnson Viking Ranger (maroon and grey case), Navy type CRI-43044 (TBY-6), RT-70, and AM-65 (Mil.)

I am also looking for someone with at least a General class license who is willing to give the Novice test to 6 or 7 people. I and a few other club members do not have licenses and we have been waiting to take our tests for a long time. The school is located in lower Manhattan near 14th St. Thank you.

Timothy O'Neill, President
Xavier High School ARC
1753 Ryder St.
Brooklyn NY 11234

I am looking for RIT mods for the Heath HW-8 CW transceiver and the Heath HW-32 20m Single Bander. I would also be interested in other mods. Thanks.

Bill Graham N8BMK
Box A223A, Rt. 5
Paris KY 40361

Any amateur who is a current or former member of the United States Army Signal Corps who has served with, or been attached to, Royal Signals is invited to become a member of the Royal Signals Amateur Radio Society. Those who wish to apply for membership should write to me for application forms and further details.

Capt. J. Cooper G3DPS
Vice-President, RSARS
"Beirnfels", Old Odiham Road
Alton, Hants
GU34 4BP, England

I need meter and maintenance instructions with parts list for a TS-375A/U vacuum-tube voltmeter. I also need an oven (Ref. S-105) with or without 5-MHz crystal for a TS-186D/UP frequency meter.

Elmer H. Melvin WA8DJY
5050 New Market Rd.
Hillsboro OH 45133

NEW PRODUCTS

from page 38

paddles and it's ready to go with automatic and programmable memories. It has iambic operation and dot-dash memory.

Five-level Baudot is transmitted at 60 wpm. RTTY and CW ID are provided via the ID button and message A. Carriage return, line feed, and letters are sent automatically on the first space after 63 characters on a line. All up and down shift is done automatically. A down shift occurs on every space to quickly clear any garbles in reception. The Baudot mode also includes all applicable features of the CW mode.

In the ASCII mode, transmission speed is 110 baud. Both upper and lower case are generated, and all the features of the Baudot mode are included here also.

Controls and keys on the 494 are positioned logically and labelled clearly; pots are used for speed, volume, tone, and weight because they are easier to use than keystroke sequences and they remember your settings even if power is lost or turned off.

The MFJ-494 operates on 9-12 V dc or 110 V ac with optional ac adapter. The same keying circuit used in all MFJ keyers is used in the MFJ-494.

Available options for the keyboard include the MFJ-53 and the MFJ-54. The 53 is an AFSK plug-in module. The output of the module plugs into the mic or phone patch jack for FSK with SSB rigs and AFSK with FM or AM rigs.

The MFJ-54 loop-keying, plug-in module is a 300-V, 60-mA, loop-keying circuit that will drive your RTTY printer.

For more information, contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762; (601)-323-5869.* Reader Service number 480.

ELECTRICAL POLLUTION CONTROL

Electrical pollution drives microprocessors bananas! Power line electrical noise, hash, and spikes often cause erratic operation. In addition, severe spikes from lightning or heavy machinery may damage expensive hardware.

Electronic Specialists recently announced the Super Isolator, designed to control electrical pollution. Incorporating heavy-duty spike/surge suppression, the Super Isolator features 3 individually dual-pi-filtered ac sockets. Equipment interactions are eliminated and disruptive/damaging power-line pollution is controlled. The Super Isolator will control pollution for an 1875-Watt load. Each socket can handle a 1000-Watt load.

For more information, contact *Electronic Specialists, Inc., 171 South Main Street, Natick MA 01760; (617)-655-1532.* Reader Service number 486.

PRECISION TWEEZER HAS BUILT-IN LIGHT

Desco Industries has added three models of battery-powered lighted tweezers to its line of electronic assembly aids. These tweezers all have stainless steel blades and are powered by a single AAA battery.

A low-cost, plastic-case model is available for working in poorly-lighted field situations. Two stainless-steel-case models are available, one with a straight tip and one with an angle tip.

For more information, contact *Desco Industries, Inc., 351 F Oak Place, Brea CA 92621; (714)-990-3005.* Reader Service number 482.

YAESU FT-902DM

Yaesu has announced an improved version of the FT-901DM, the FT-902DM. While the 902 retains most of the features of its predecessor, several important changes have been made.

The 902 covers all present and proposed HF amateur bands, including the new WARC bands. The digital frequency readout has been improved to eliminate the need for recalibration when changing modes or bands. The built-in keyer features both dot and dash memories, and the receiver's dynamic range has been improved. Last, but not least, the vfo knob now tunes in the right direction!

For more information, contact *Yaesu Electronics Corp., 6851 Walthall Way, Paramount CA 90723.* Reader Service number 485.

TEMPO S-4

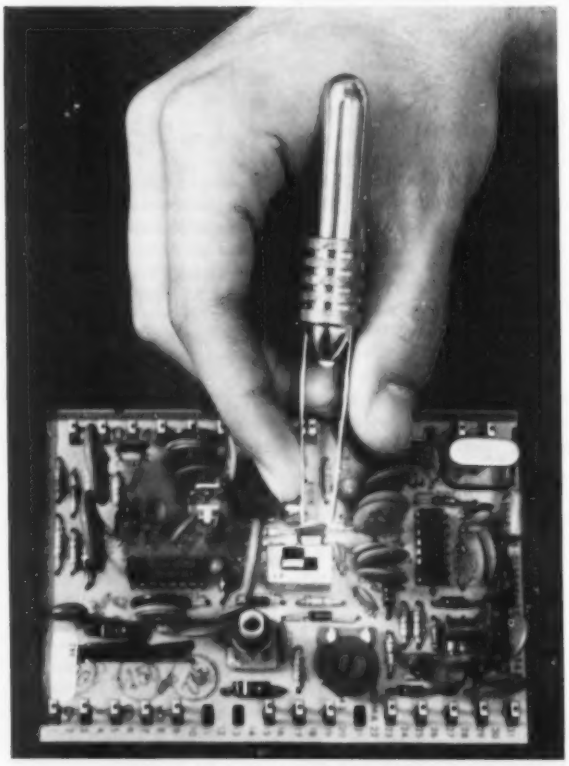
Tempo, a pioneering manufacturer in the field of synthesized hand-held radios, has announced a new 440-MHz FM hand-held. The new S-4 is nearly identical to the other Tempo hand-helds which are offered for the 2-meter and 220-MHz bands.

Available accessories include 12- or 16-button touchtone™ pads, CTCSS tone encoder, and a leather carrying case.

For more information, contact *Henry Radio, 2050 S. Bundy Dr., Los Angeles CA 90025.* Reader Service number 481.

NEW MFJ HF WATTMETER

The new MFJ-814 HF wattmeter/swr meter has a frequency range of 1.8-30 MHz. It reads forward and reflected power on two scales (2 kW and 200 Watts) on a 2-1/2" wide × 1-1/2" high lighted meter (light



Desco Industries' precision tweezer.

The MFJ-814 HF swr wattmeter.

requires 12 volts).

This power meter also reads swr directly and is calibrated up to 6 to 1 swr. Three push-button switches let you switch between power and swr, high and low power, and forward and reflected power.

Eggshell white with black top and sides, the meter measures 6-1/4" × 3-1/2" × 3-1/2".

For more information, contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762; (601)-323-5869.* Reader Service number 484.

NEW MODEL FROM ALUMA TOWER

Designed especially with the ham operator in mind, Aluma Tower's new extra-heavy-duty aluminum tower meets our special needs. All uprights and cross braces are 1" seamless drawn-aluminum tubing with stainless steel aircraft cable connecting the telescoping sections. The mast is 2" diameter × 8' long and is supplied bolted in place.

Aluma Tower's telescoping construction and tilt-up style enable it to withstand any weather conditions.

For more information, contact *Aluma Tower Company, 1639 Old Dixie Highway, Vero Beach FL 32960.* Reader Service number 479.

HY-GAIN ADDS THREE NEW PRODUCTS TO TOWER LINE

Telex Communications, Inc., has announced the addition of three new products to its Telex/Hy-Gain tower line. The HG-70HD, a new 70-foot (21.3 m), self-supporting crank-up tower, is the tallest of seven towers now offered by Telex/Hy-Gain. The tower is all steel, has four sections, and features an improved guide system providing rigid, close-tolerance structural support while leaving the tube ends open for complete surface galvanizing and unrestricted moisture drainage. This heavy-duty tower was designed for antenna loads of up to 16 square feet (1.5 sq. m) in winds of up to 60 mph (96.6 kmph). The top section is pre-drilled for thrust bearing bolts, and a rotor mounting plate is included.

Hy-Gain has also developed a new electric winch system, model HG-EW, that fits the new HG-70HD as well as the existing 54-foot (16.5 m) HG-54HD and the 52-foot (15.8 m) HG-52SS. The winch control box can be locked, which allows the tower to be secure in either the extended or retracted position. It has a limit switch which prevents a possible overload at the upper stop position. A manual crank is supplied also in the event of an electrical power failure. The HG-EW is equipped with an automatic brake which is always in positive engagement when the winch is not operating.

This winch system can be converted at any time to remote-control operation by adding the new Hy-Gain tower control (HG-EWRC) which has been specifically designed as a modular addition to the HG-EW winch. This remote-control unit allows the operator to raise and lower the tower from a remote location such as a ham shack. The control displays upper and lower limit positions, up or down operating direction, and also provides a fail-safe sensor and indicator which automatically shuts off the winch should extreme side loads affect tower telescoping. Both the winch and the remote control are available for 110- and 220-volt operation.

For more information, contact *Hy-Gain, 9600 Aldrich Ave. South, Minneapolis MN 55420; (612)-884-4051.* Reader Service number 483.

LETTERS

from page 24

Peking, and the street next to it was full of shops. One large department store had a department selling only radio parts such as resistors, capacitors, tubes, transistors, etc., for people who wanted to repair their own radios.

They also had a black and white TV on sale for about $1000 US.

I saw two fairly large telegraph keys but I could not find anyone who spoke English to find out what they were used for.

There was also a shop nearby which sold only TVs. Incidentally, mine in the hotel did not work.

Fred Barnes WA8PCT
Parma OH

ITS UGLY HEAD

It was interesting to read the letter in the July *73* sent to Dr. Zbigniew Brzezinski by Dave Clark K8MPF regarding his proposal to boycott stations in the USSR using the special Olympic prefixes. In the letter, Dave states, "Normal communications with the Soviet U prefixes should be encouraged since amateur radio does provide a system of direct communication to all parts of the world regardless of political relations."

I should like to point out to your readers that in the case of the Soviet Union this is not entirely true. Since June, 1967, the Soviet authorities have forbidden their hams to communicate with Israeli amateur stations using the 4X or 4Z prefix. Although to my knowledge there has never been an official press release to this effect on the part of the USSR, it is common knowledge here, and a call to a U or an R station or what have you is almost always ignored except for the occasional station who will say "sorry, can't work you," or "no contact." For the Israeli DXer or contest fanatic, this is a serious handicap as this makes it virtually impossible to contact or confirm 19 Soviet Republics (countries) and four zones.

What is interesting is that in the last few years, amateurs visiting Israel from other countries and operating here with their own calls with a slant 4X tacked on the end find themselves besieged in pileups of Russian amateurs calling them. This indicates that the Russians have relaxed their boycott of amateur radio in Israel to the extent of allowing contacts *only with non-Israelis operating here.* The reason for this is not clear, but it could likely be to avoid bad public relations with American and European hams visiting here.

After much deliberation on the problem, the Israel Amateur Radio Club has asked amateurs operating here with foreign callsigns to avoid contacting Soviet stations until the Soviet Union rescinds its ban on contacts with Israeli stations, and to make this clear to the Soviet stations calling them.

It sure is a pity that politics raises its ugly head in this area. It should be added, however, that we have no problems contacting the other eastern European countries, but the USSR countries are all missing in the tallies of hams here who have been DXing since 1967. We are still hopeful that one day this condition will be reversed.

Hams visiting Israel are invited to use our 2-meter repeaters and meet the boys (and girls, hi) here. We use the European band plan here, and the repeaters are as follows: HAIFA—R0—145.000 in, 145.600 out (1800 Hz tone access); SAFED (upper Galilee)—R3—145.075 in, 145.675 out; BEERSHEBA—R5—145.125 in, 145.725 out; TEL AVIV—R7—145.175 in, 145.775 out, and JERUSALEM—R9—145.225 in, 145.825 out. Only the Haifa machine requires a tone burst; all the rest are straight carrier access.

Ron Gang 4Z4MK
Kibbutz Urim, Israel

VHF CONTESTING

A short note to express my interest in the January article, "VHF Contesting." The appetizer was delicious; now when do you begin the meal? You provided a few details on equipment, antennas, spacings, and just enough to evoke, "yes, yes, go on." So... let's have more of the detail so that more of us can learn more and successfully give it a go.

Bob Munsey K6PIU
Canoga Park CA

WORK THE WOODPECKER

The January issue of *73* has a couple of items on which I would like to comment.

First is the Woodpecker. When it first came on the air, the DX fraternity on 15 and 20 had a lot of ideas of what might be done to chase it off the ham bands. The "H5H" sequence was one of them, but not very practical for those of us who

don't have keys as part of our ham station or who are essentially lazy. We don't have the power to compete with Radio Moscow to QRM them, but radar depends on receiving an echo for its results and that echo can't possibly be a match for a ham kW beamed in the right direction with a similar signal. All one has to do is tape record a few minutes of the woodpecker and play it back at them!

If all the "tuner uppers" and "pileup" participants would get together on a "Woodpecker's Sunday" and send out the taped signal all over the band at the same time, perhaps they might get the message.

The other is your story, "Over the Hump" and the references to AC4YN. Of course, before the war AC4YN was the legendary contact that you had to work to get Zone 23. Your article mentions Reggie Fox as AC4YN, but I have reason to believe that it was a British Army group operations and that there were others that used the call either before or after Reggie.

I served in Italy during WWII at AFHQ Italy in a combined US Signal Corps/Royal Signals operation, which has made me eligible for membership in the Royal Signals Amateur Radio Society. Currently, there are about ten U.S. hams who belong to RSARS. I got a life membership back when the pound was worth $1.80. I get a lot of mileage out of that connection with QSOs with "G" stations. At the time I joined, one of the officers was Sir Evan Neppan G5YN. There was quite a story on Sir Evan in the Society publication, *Mercury*. He was a career officer in the British Army, had operated from exotic spots all over the world, and had been knighted by the Queen. It appears that one of the calls he had held was AC4YN, so you figure that out! I had a nice letter from him when I joined and have worked him on the air.

Col. Edson B. Snow, AUS Ret.
Pompano Beach FL

REVIEW

from page 30

ed a measure of additional gain.

Our basic downconverters soon acquired an elaborate "look" which reminded us of a mini-TVRO setup, and we somehow felt we had set new DX records for solid MDS reception in this heavily wooded and mountainous area of the United States. One aspect has definitely proven true: Signal paths which are not line of sight are difficult to predict and use. Raising antenna height to acquire line of sight is often the only logical alternative.

Some additional members of our group decided to construct competitive and more expensive downconverters, reasoning that complexity and cost should provide better results. Unfortunately, we did not find that true and had to work like heck to get marginally acceptable results from those units. Our previously acquired knowledge of microwave construction techniques was also required to supplant marginal instructions used with these units.

Fortunately, however, we all came out winners at the end and except for me, everyone is presently enjoying watching special TV programs. My particular converter works great, but I'm 20 miles, two mountains, and one dense forest from the MDS transmitter. Plans include wrestling a 3.5-foot parabolic dish/downconverter setup to the top of an 80-foot pine tree and adding a second TV tuner between the converter and the television for additional gain. We're not giving up yet!

In conclusion, the Universal Communications downconverter kits have proven their worth and are very reliable units. If you would like to get your feet wet in microwave, MDS, or weather satellite reception, these units are a good starting point. At the present time, I'm also considering the feasibility of modifying a unit for TV satellite reception. A number of additional items also will be required, but a working system for under $400 looks very promising.

The original downconverter board described here is available from *Universal Communications, Box 6302, Arlington TX 76011.*

Dave Ingram K4TWJ
Birmingham AL

Realistic DX-200 communication receiver.

DX-200 RECEIVER

The DX-200, sold by Radio Shack, is a general-coverage receiver. It tunes five bands: 150 kHz to 400 kHz, 520 kHz to 1.6 MHz, 1.55 MHz to 4.5 MHz, 4.5 MHz to 13 MHz, and 13 MHz to 30 MHz. It is designed for the reception of the three most-used forms of amplitude-modulated signals, which are double sideband with carrier (AM, or 6A3), single sideband without carrier (SSB, or 3A3j), and make-and-break radiotelegraphy (CW, or 0.1A1). The basic design is the classic single-conversion superheterodyne with an intermediate frequency (i-f) of 455 kHz. The circuit provides one stage of preselection before the frequency conversion.

To evaluate this receiver, it was compared with two others, each of recognized performance capability but of other design and in a higher cost bracket. A coaxial switch was used to switch the reference antenna among the three receivers, thereby ensuring a comparable signal to each. In addition to off-the-air signals, a URM-25D signal generator was used to make measurements of sensitivity and of image rejection.

One of the comparison receivers was a Yaesu Model FRG-7, which uses the Wadley Loop system. This involves triple conversion, with a first i-f of 55 MHz, to ensure almost total freedom from images. The other was the receiver section of a Kenwood TS-120S. This is a single-conversion receiver with an i-f of 8.8 MHz. Unless otherwise stated, off-the-air signals were obtained from an 80-meter trapped dipole antenna mounted 50 feet above ground.

Initially, the DX-200 was tuned to the AM broadcast band. Here it performed very well indeed. Both selectivity and sensitivity were excellent, and the stability adequate. I rated it on a par with the FRG-7 with but one exception. With the rf gain control turned fully on, the set broke into oscillation, causing severe distortion. Backing off slightly on the gain control stopped the distortion. With a short indoor antenna, the rf gain could be advanced fully without distortion.

The second check was on the longwave band. The DX-200 did quite well. It is one of the very few longwave receivers I've heard that doesn't bring in local broadcast band stations almost as loudly as LF stations! There was some slight spillover but not enough to be troublesome.

In the high-frequency range, the receiver displayed varying degrees of performance. For the reception of shortwave BC stations, it did quite well over the whole spectrum, fully equaling the FRG-7 in all respects save one: image rejection above 5 or 6 MHz is very poor. The selectivity and sensitivity were fully adequate for SWLing and I didn't notice any frequency drift. Even the sponginess of the bandspread dial was not too objectionable.

For the reception of HF SSB stations, the level of performance dropped. In the MF 160-meter band and in the HF 80- and 40-meter bands, signals could be demodulated with ac-

ceptable intelligibility. As I went higher, the signal quality became much worse. On 11 and 10 meters the clarity approached zero! It appears that there is enough instability in either the HF oscillator or the beat frequency oscillator (I suspect the former) to introduce severe fuzziness. These signals were, of course, also checked on both the FRG-7 and the TS-120S to make sure that the difficulty originated in the DX-200 and not in the transmitter or in some propagation abnormality.

CW reception is a bit better than that of SSB in that one can read a T5 note with no difficulty. In fact, there are operators who prefer modulated notes over that of a pure sine wave! The sponginess of the bandspread dial makes tuning in a CW signal a bit of a job, but it can be done with practice and patience. It's a wee bit more tedious than the FRG-7; the TS-120S, of course, presents no tuning difficulties.

The next job tackled was attempting to improve the image rejection for frequencies above 5 or 6 MHz. Two passive preselectors (shown in Fig. 1) were tested. One is of a type designed to match a random-length endfed antenna to a low impedance input to a receiver. The other is for low-Z to low-Z; it was used with the trapped dipole.

Both preselectors performed about the same. They helped to attenuate images in the 5- to 10-MHz range, but above 10 MHz their selectivity curves were so broad that they provided insufficient attenuation to the image. And, of course, this is the region that most needs additional image attenuation! Scratch the idea of a passive device.

An active preselector, a leftover from the day when I had a DX-150 receiver, was excavated from my junk box. Its circuit is shown in Fig. 2. In addition to providing preselection, it supplies an appreciable amount of gain. Now the DX-200 had plenty of gain, but I noticed that it performed somewhat better with its rf gain control backed off a bit from fully clockwise. From that standpoint, the additional gain from the active preselector is valuable.

Its image rejection ability was evaluated with signals from the antenna and signals from the URM-25D signal generator. For the latter, a signal was injected into the receiver at a level which caused a predetermined deflection of the receiver's S-meter. Both that deflection and the URM-25D's microvoltmeter indication were noted. The DX-200 was carefully tuned to the signal's image and its S-meter reading noted. Next, the URM-25D's output was advanced until the referenced S-meter deflection was again reached. Reading the new value from the microvoltmeter provided an indication of the receiver's image rejection capability. Then the active preselector was introduced into the circuit. It was tuned to the URM-25D's output frequency and the whole series was repeated. The additional increase in signal generator output to return the S-meter to its referenced value gave a comparative indication of the effectiveness of the preselector. No attempt was made to tabulate absolute values; only comparisons were desired.

The results showed that neither the FRG-7 nor the TS-120S had enough image response to be recorded. Also, the active device was significantly better than either of the two passive preselectors. Above about 16 MHz, however, even the active circuit's image rejection became marginal. It added useful gain, however.

My conclusion is that it is not feasible to attempt to make significant improvement in the image rejection capability of a receiver having an i-f of 455 kHz for reception of signals above 16 MHz unless one is prepared to use at least two and probably three additional tuned circuits.

The lack of good image rejection on the higher frequency ranges does not mean that the DX-200 is not a good receiver. It is highly sensitive and is as selective as one might want for reception of AM voice and music broadcasts. It is stable enough to require no retuning once you've centered on a station. For many decades radio listeners used receivers having the same basic circuit as the DX-200 and found such receivers quite satisfactory. The average SWL will find that the DX-200 fulfills his requirements in a satisfactory manner.

I found many things to like about the DX-200. Its bandspread is very good, the quality of the internal speaker is better than average, and there's a ¼" headphone jack on the front panel. The external speaker jack on the rear is of the miniature type. Inspection of the schematic wiring diagram reveals that there's a resistor in series with the internal speaker and also one in series with the headphone jack, but none in series with the external speaker jack. Evidently, the audio output is higher than the internal speaker can handle, yet this speaker provides room-filling volume.

The wiring diagram makes an interesting study. The receiver's designers came up with some neat tricks—too many to comment on. They have one practice I cannot admire, though. That is designing the receiver to have its power supply activated at all times when the 117-volt power plug is inserted into the wall socket.

Still on the subject of the wiring diagram, it would appear that the set's overly-optimistic S-meter might be made more nearly realistic by adjusting resistor VR202. If its 1k range is insufficient, the addition of a series resistor might do the job. If not, you always can tame an overly-active S-meter with a shunt resistor.

The DX-200 has an owner's manual that's really outstanding. In addition to information on the receiver, it has many excellent tips on using it. I did find four items in it that irked me; all related to nomenclature. The manual calls all random-length endfed antennas "long wires," which is incorrect, as a long-wire antenna is one many wavelengths long! The other three were in the list of radio terms, which showed "73s" instead of 73, "88s" instead of 88, and XYL instead of YF. But those four glitches do not seriously detract from the overall excellence of the manual.

To sum up, the DX-200 is as good a receiver of its design as you're likely to find for the price. Its design, the classic single-conversion with an i-f of 455 kHz, has inherent limitations. Within these limitations, the DX-200 rates highly, with just two exceptions: the lack of spectral purity in the oscillator and the rubbery feeling of the bandspread tuning dial. If these were corrected, Radio Shack would have a receiver that would be difficult to fault.

For further information, contact *Radio Shack, a division of*

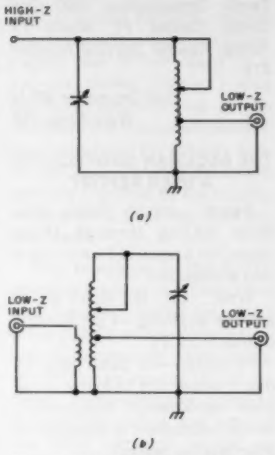


Fig. 1. Passive preselector circuits for the DX-200. (a) For random-length endfed antennas. (b) For low-impedance antennas.

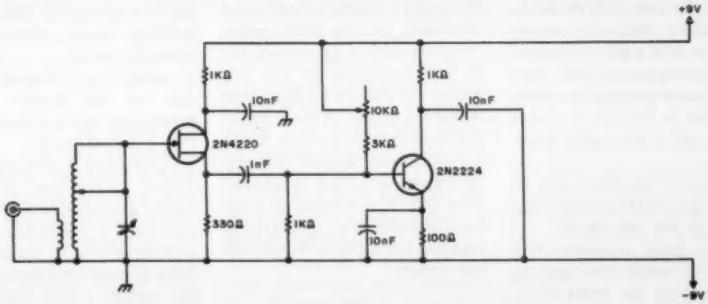


Fig. 2. Active preselector and preamplifier.

Tandy Corporation, 1300 One Tandy Center, Ft. Worth TX 76102. Reader Service number 477.

Carl Drumeller W5JJ
Warr Acres OK

THE BECKMAN 3010/TECH 310: A USER REPORT

Pssst...pssst. Yeah, you. Stop leafing through these pages for a second, I want to ask you a question.

Well...OK, but don't try to sell me anything—I get enough of that from TV.

I promise—no sales pitch today. I would like to know, of all your workbench equipment, which instrument is essential to your testing needs?

That's easy: my ohmmeter.

I agree, the multimeter is the foundation for most of our diagnostic procedures. What is the reason for its wide popularity? Why do we depend on it so much? Many test instruments have proven invaluable as troubleshooting aids, yet they enjoy little of the multimeter's success. I think that a prime factor for the analog's success is its tradition of combining versatile service with a low price tag. Today's new digital multimeters continue to carry out this fine tradition, perhaps improving upon it. One of the better of these is the Beckman Superswinger.

Hold it! Are you sure you got the name right? I've been shopping for a DMM, and I have never heard of this Superswinger.

I'm positive! You see, I made up the name.

Boy, that's all I need! As if it weren't enough trouble keeping track of all the real meters, now some joker invents his own.

If you will be patient a moment, I hope to clarify the situation. I devised this designation to represent two *real* Beckman models, the Tech 310 and the 3010. A sound reason exists for merging the two: they're identical. Identical, that is, if you discount the 3010's blue case and the 310's tan-colored one. Selling the same product in different boxes is strange in itself; stranger still is asking the same price.

Strange? It sounds dumb to me. Why go to all the trouble and expense in the first place?

A very good question. The answer lies within the mystical realm known as marketing. Beckman, with logic only a marketing analyst could love, elected to attack the formidable meter market with two entirely separate sales forces. The first, with the 3000 series, focuses its efforts on the large industrial user, while the 300 team tackles the end-user market. I am told that this dual-meter, dual-designation approach is invaluable for accurately gauging market penetration. While on the subject of dual designations, unless clarification is needed, I shall confine my comments solely to the 3010.

Beckman Tech 310 digital multimeter.

One fact stands out through all of marketing's dust and confusion: Beckman makes an incredibly good meter.

Ha! I've heard that one before. Prove it.

I will substantiate my claim with some cold, hard facts: Beckman's unadulterated specifications for the 3000 series. This information applies equally to the members of the 300 group, but there is an additional meter not shown in the specs—the Tech 300. It has the 3010's specifications except that the dc voltage accuracy is reduced from 0.25% to 0.50%. In addition, both the 10-A current range and the Insta-Ohms™ function are absent.

I like the specs, but how much would it syphon from my bleak-looking bank account?

I'm glad you're pleased with the 3010's numbers. Nevertheless, as you must already know from examining today's market, most DMMs have attractive-looking figures. What earns the Beckman its $140 price tag is its superior performance in the real world.

$140! My wife would kill me.

I realize that the price tag seems a bit heavy, but the excellent quality of the 3010 with its easy, dependable, and versatile operation makes it a great buy. Take operator ease. Many users are momentarily dumbfounded when confronted by some DMMs and their rows of push-buttons or multiple switches. With the Beckman, you will never have this problem. There is positively no confusion or ambiguity in using the 3010's solitary, large, analog-styled selector switch.

I admit the 3010 looks easy to use, but why should I buy it, when I can get a cheaper DMM that is just as good?

Purchasing a less expensive digital multimeter is by no means a difficult task. Matching Beckman's craftsmanship is another story. To be fair, let's make a quick comparison of the two meters. I think you'll agree that ruggedness is a desirable attribute in test equipment, and essential for all portable instruments. Multimeters are no exception and must endure a multitude of sins in the form of knocks, bumps, and scrapes. Some of these can be nastier than others; a fall could be fatal. If you were to accidentally knock your bargain meter off the top of your workbench, would it survive?

Ouch! I hope so. Although I do remember dropping my VOM once; it never worked the same again.

I'm afraid your bargain-basement friend will share much the same fate: dead on arrival. If you owned a 3010 in this situation, you may suffer heart failure, but the meter will remain healthy. Meeting military shock and vibration standards, the 3010 is capable of withstanding the abuse from a six-foot fall without blinking a digit. This ruggedness stems in part from the fire-retardant, high-impact ABS plastic case, but, to a larger extent, it is due to Beckman's careful engineering. This attention to detail is evident when you examine the outside. All vulnerable areas, including the 3½-digit liquid-crystal display, function switch, and test jacks, are recessed out of harm's way. Venturing inside, we find the explanation for the 3010's great strength—an unbelievable low number of parts. The credit for the fewer than forty active components goes to a custom-designed CMOS LSI multiprocessor. Helped by a CD4069 hex inverter, this LSI chip performs all the active DMM functions, which results in a small, compact, and extremely reliable digital multimeter.

Ruggedness is only a start; Beckman goes much further to ensure a reliable meter with a long and healthy life. Living in the "northwets," I appreciate the extra effort that has gone into sealing the 3010. It is well-suited for this climate, offering no easy pathways for the liquid sunshine, dirt, or other contaminants. On most multimeters, the test jacks are open gateways into the interior. Beckman closes the gate by physically dead-ending these. While an O-ring protects the selector switch, a large gasket seals the LCD display area. I have been told that the 3010 is so well sealed that it will float. You need not take your DMM swimming to avail your-

self of this added protection. A recent graphic demonstration from a skeptical friend pointed this out. He watched in helpless horror as a glass of iced tea, liberally laced with sugar, dispatched his three-month-old DMM to silicon heaven.

Beckman enhances the reliability of the 3010 further by giving each meter a 100% burn-in, followed by a complete test of each function and every range. All of this results in a digital multimeter that is trouble-free and backed by a one-year warranty under which Beckman agrees that:

If the instrument fails for any reason whatsoever, except abuse, Beckman will (at its election) repair or replace the multimeter with a new or reconditioned unit of equivalent quality.

That sounds too good. Service must take forever!

Wrong. There is only one word that can describe Beckman's service: phenomenal! You will get no excuses or interminable delays when you have an ailing meter. Instead, within one working day from the receipt of the meter at a service center, a new or reconditioned unit will be *air* shipped to you.

The 3010 certainly seems well built. Yet, that price still scares me a little.

Your reservations will fade after getting to know some of the 3010's features better. The same custom CMOS chip that helps make the 3010 so tough also contributes other useful traits. The CMOS construction in conjunction with the low-power LCD display ensures a long battery life. A 9-volt alkaline battery supplies 2000 hours of *continuous* operation. Under normal operating conditions you can expect two years of service from a single battery. That's ten times longer than other hand-held 3½-digit meters provide. Couple this longevity with a low-battery warning that signals for the last 200 hours of operation and you have erased any excuse for a dead battery. This low power drain also frees the user from external power sources, adapters, and chargers which add unnecessary weight. The 3010 weighs in at a modest 16 ounces.

In the world of micro-electronics, where minute voltages and infinitesimal currents are precariously balanced, outside disturbance from low-impedance sources can be disastrous. The 3010's high input impedance of 22 megohms babies delicate circuitry with less than half the loading of the conventional DMM's 10-megohm impedance. In fact, this meter's load factor is far lower than most VOMs.

A baby around delicate equipment, the 3010 does not play nursery games when it comes to life's crueler realities—destructive overloads. The meter will tolerate transgression as high as 1500 V dc/1000 V rms on the voltage inputs, and the resistance area is protected to 300 V dc/rms. Both can ward off evil transients up to 6000 volts in size. The 2-A current range is fused against overloads, but the 10-A range is vulnerable. Making use of an internal, 0.001-Ohm resistor, this 10-A function is totally defenseless, lacking the most paltry of fuses. A glaring omission on Beckman's part? In a way, yes, because this does open the door to operator abuse. On the other hand, by being aware of the potential danger and by observing a 30-second time limit, one can extend the upper current boundary to 20 Amps. I have successfully made measurements in excess of 17 Amperes with no ill effects. However, I cannot stress strongly enough the need to strictly adhere to the 30-second limitation!

Another feature worth mentioning is the in-circuit diode/transistor test function. One aspect of the 3010 is that all the resistance ranges are low powered, and as such cannot forward-bias a semiconductor. This necessitates that a separate test function be added to the meter. As usual, Beckman goes first class by employing a dedicated constant-current source, which, when in operation, shows the actual voltage dropped across a semiconductor junction, eliminating all guess work. The test, if performed in-circuit with a parallel resistance greater than 200 Ohms, is completely transparent.

I like all of the 3010's fine features, but my favorite is Insta-Ohms, Beckman's fast, versatile continuity indicator. At the moment of continuity detection, an Ohm symbol is displayed in the upper left-hand corner of the LCD display. With its virtually instantaneous operation, Insta-Ohms has created a wealth of tests never before feasible on a purely digital multimeter, including those with audible indicators. Prompt detection (less than 100 milliseconds) allows the 3010 to accomplish analog-style tests such as checking a capacitor's ability to accept and hold a charge. In this case, the analog needle is replaced by the Insta-Ohms symbol, which appears quickly as the test begins. The charging capacitor's apparent resistance falls within twice the maximum of the selected range.

A readout of the resistance follows almost immediately. The cap's steadily building charge swings the reading upward toward infinity, until a point is reached where one of two things will happen. Depending on the selected resistance range, either the readout and Insta-Ohms will overflow, or a final breakdown value for the capacitor will be found. The necessity for fast electronics in this test becomes obvious when you involve small value caps with their short time constants. The Insta-Ohms speed is such that I have had no problem checking 2.2-uF and smaller tantalums.

Insta-Ohms has several important advantages over ohmmeters and audible continuity indicators. First, with the overload protection of 300 V dc/rms, you don't have to worry about a damaged meter movement or bent and broken needles. Second, as part of the liquid-crystal display, the indicator uses little power, contributing greatly to the meter's two-year battery life. Finally, because it isn't limited to one or two resistance ranges, Insta-Ohms is useful in tracking down high-impedance "shorts." You also have the blessing of not having to use an override switch on large jobs to kill the incessant buzz that drives fellow workers up the wall.

I'm impressed. I think I'll spend the extra bucks.

In that case, you should be glad to hear that the 3010 comes ready to use, having a battery, spare fuse, safety test leads, and operator manual. Beckman's attention to detail and quality carries into their excellent accessories. The awkward-looking test probes are actually comfortable to use. So much so that I never gave them much thought. Nonetheless, they exerted an influence on me, however subtle. This influence became evident when I had the occasion to use a regular pair of test leads on a 240-volt power supply. I was distinctly apprehensive at the time, and the reason why eluded me. I now know the reason: Subconsciously, I missed the added security imparted by the knobby node end of Beckman's safety test leads.

This brings us to the 3010's operator manual. It is one of the best I've seen. Unlike the scant, inept papers some manufacturers try to pawn off as manuals, the Beckman manual is an in-depth, comprehensive guide to the understanding and use of the 3010. Although faulted as being too long, a premise I do not share, the manual is worth the reading effort.

OK, OK, I'm convinced. Well, almost. There has got to be a zinger—you haven't mentioned one bad word about the meter!

Zinger? I don't know if you could classify them as such, but there are a couple of items that I'm a little less than thrilled about. One, and the brunt of my dissatisfaction must fall upon it, is the 3010's built-in tilt-bail. Conceived as a dual-purpose hanger/bench support, the wire bail is all too flimsy for hanging the meter. Its most unforgivable sin of sins is the metal construction which makes it a great conductor and, thus, dangerous.

The only other fault with the 3010 is that you cannot zero the resistance function. This becomes a factor only when using the lowest range, and the resistance of the test probes is displayed. Less than 0.2 of an Ohm in value, my objection centers on the fact that no means of zeroing this reading is provided.

You've made a sale! I can contend with those easily.

Fine—my sentiment exactly. If you want to hunt exotic non-sinusoidal waveforms like triangles and ramps, look into Beckman's RMS 3030—currently the only hand-held DMM with true-rms measurement capability.

For more information, contact *Advanced Electro-Products Division, Beckman Instruments, Inc., 2500 Harbor Blvd., Fullerton CA 82634; (714)-871-4848, ext. 3651.* Reader Service number 476.

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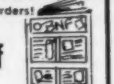

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3.9pf	68pf	360pf	3300pf
4.7pf	82pf	390pf	3900pf
5.6pf	100pf	430pf	4700pf
6.8pf	110pf	470pf	5600pf
8.2pf	120pf	510pf	6800pf
10pf	130pf	560pf	8200pf
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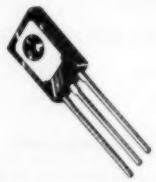

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4060/2107	4K x 1 Dynamic RAM	3.99
4050/9050	4K x 1 Dynamic RAM	3.99
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2112A-2	256 x 4 Static RAM	3.99
2115AL-2	1K x 1 Static RAM 55ns	4.99
6104-3/4104	4K x 1 Static RAM 320ns	14.99
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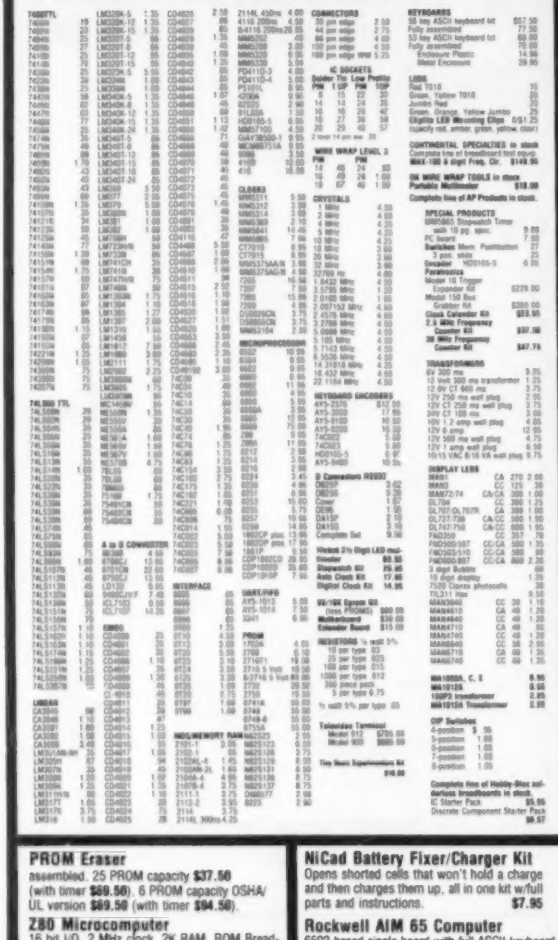

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An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key **HEX keyboard** includes 16 HEX keys plus **load, reset, run, wait, input, memory protect, monitor select** and **single step**. Large, on board displays provide output and optional **high and low address**. There is a 44 pin standard connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for **all** IC's are included in the price plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info. including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95, Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** All metal Expansion Cabinet, painted and silk screened, with room for 5 S-100 boards and power supply **$57.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also completely assembled and tested.

Questdata, a software publication for 1802 computer users is available by subscription for $12.00 per 12 issues. Single issues $1.50. Issues 1-12 bound $16.50.

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This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed.** EPROM can be used for the monitor and Tiny Basic or other purposes. **A 1K Super ROM Monitor $19.95** is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85, RS 232 $4.50, TTY 20 ma I/F $1.95, S-100 $4.50. A 50 pin connector set** with ribbon cable is available at $15.25 for easy connection between the **Super Elf** and the **Super Expansion Board.**

Power Supply Kit for the complete system (see Multi-volt Power Supply).

Quest Super Basic V5.0

A new enhanced version of **Super Basic** now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function **Super Basic** by **Ron Cenker** in, uding floating point capability with scientific notation (number range $\pm .17E^{\pm 38}$), 32 bit integer ±2 billion; multi dim arrays, string arrays; string manipulation; cassette I/O; save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

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1802 16K Dynamic RAM Kit $149.00

Expandable to 32K. Hidden refresh w/clocks up to 4 MHz w/no wait states. Addl. 16K RAM **$63.00**

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Super Monitor VI.I Source Listing $15.00

Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

Super Color S-100 Video Kit $129.95

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80 etc.

Dealers: Send for excellent pricing/margin program.

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1802 Tiny Basic Source listing $19.00

Super Monitor V2.0/2.1 Source Listing $20.00

PROM Eraser

assembled. 25 PROM capacity **$37.50** (with timer **$89.50**). 6 PROM capacity OSHA/UL version **$89.50** (with timer **$94.50**).

Z80 Microcomputer

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$99.00.** Monitor **$20.00.** Power Supply Kit **$35.00. Tiny Basic $30.00**

S-100 Computer Boards

8K Static Godbout Econo IIA Kit	149.00
16K Static Godbout Econo XIV Kit	269.00
24K Static Godbout Econo XX-24 Kit	414.00
32K Static Godbout Econo XX-32 Kit	537.00
16K Dynamic RAM Kit	289.00
32K Dynamic RAM Kit	328.00
64K Dynamic RAM Kit	399.00
Video Interface Kit	**$139.00**

80 IC Update Master Manual $39.00

Comp. IC data selector, 2700 pg. master reference guide. Over 51,000 cross references. Free update service through 1980. Domestic postage $3.50.

Modem Kit $80.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. only $17.00.

LRC 7000 - Printer $389.00

40/20 column dot matrix impact, std. paper. Interface all personal computers.

64/40/32/20 version **$495.00.** Optional cables available.

LRC 7000 printer interface cable for Super Elf with software $35.00

NiCad Battery Fixer/Charger Kit

Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. **$7.95**

Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display. ROM monitor, fully expandable. **$405.00.** 4K version **$450.00.** 4K Assembler **$85.00**, 8K Basic Interpreter **$100.00**.

Special small power supply for AIM65 assem. in frame **$54.00.** Complete AIM65 in thin briefcase with power supply **$499.00.** Molded plastic enclosure to fit both AIM65 and power supply **$47.50.** Special Package Price: 4K AIM, 8K Basic, power supply, cabinet **$625.00.**

AIM65/KIM/VIM/Super Elf 44 pin expansion board; 3 female and 1 male bus. Board plus 3 connectors **$22.95.**

60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

Video Modulator Kit $9.95

Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option, ±5v, ±12v are regulated. Basic Kit **$29.95.** Kit with chassis and all hardware **$43.95.** Add $4.00 shipping. Kit of hardware **$14.00.** Woodgrain case **$18.00.** $1.50 shipping.

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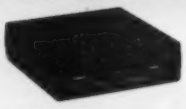

9 DIGITS 600 MHz $129.95 WIRED

The CT-90 is the most versatile, feature packed counter available for less than $300.00! Advanced design features include; three selectable gate times, nine digits, gate indicator and a unique display hold function which holds the displayed count after the input signal is removed! Also, a 10mHz TCXO time base is used which enables easy zero beat calibration checks against WWV. Optionally; an internal nicad battery pack, external time base input and Micro-power high stability crystal oven time base are available. The CT-90, performance you can count on!

PRICES

CT-90 wired, 1 year warranty	$129.95
CT-90 Kit, 90 day parts warranty	104.95
AC-1 AC adapter	3.95
BP-1 Nicad pack +AC Adapter/Charger	12.95
OV-1, Micro-power Oven time base	49.95
External time base input	14.95

SPECIFICATIONS:

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 10 MV to 150 MHz Less than 50 MV to 500 MHz
Resolution:	0.1 Hz (10 MHz range) 1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	9 digits 0.4" LED
Time base:	Standard-10.000 mHz, 1.0 ppm 20-40°C. Optional Micro-power oven-0.1 ppm 20-40°C
Power:	8-15 VAC @ 250 ma

7 DIGITS 525 MHz $99.95 WIRED

SPECIFICATIONS

Range:	20 Hz to 525 MHz
Sensitivity:	Less than 50 MV to 150 MHz Less than 150 MV to 500 MHz
Resolution:	1.0 Hz (5 MHz range) 10.0 Hz (50 MHz range) 100.0 Hz (500 MHz range)
Display:	7 digits 0.4" LED
Time base:	1.0 ppm TCXO 20-40°C
Power:	12 VAC @ 250 ma

The CT-70 breaks the price barrier on lab quality frequency counters. Deluxe features such as; three frequency ranges - each with pre-amplification, dual selectable gate times, and gate activity indication make measurements a snap. The wide frequency range enables you to accurately measure signals from audio thru UHF with 1.0 ppm accuracy - that's .0001%! The CT-70 is the answer to all your measurement needs, in the field, lab or ham shack.

PRICES:

CT-70 wired, 1 year warranty	$99.95
CT-70 Kit, 90 day parts warranty	84.95
AC-1 AC adapter	3.95
BP-1 Nicad pack + AC adapter/charger	12.95

7 DIGITS 500 MHz $79.95 WIRED

PRICES

MINI-100 wired, 1 year warranty	$79.95
MINI-100 Kit, 90 day part warranty	59.95
AC-Z Ac adapter for MINI-100	3.95
BP-Z Nicad pack and AC adapter/charger	12.95

Here's a handy, general purpose counter that provides most counter functions at an unbelievable price. The MINI-100 doesn't have the full frequency range or input impedance qualities found in higher price units, but for basic RF signal measurements, it can't be beat! Accurate measurements can be made from 1 MHz all the way up to 500 MHz with excellent sensitivity throughout the range, and the two gate times let you select the resolution desired. Add the nicad pack option and the MINI-100 makes an ideal addition to your tool box for "in-the-field" frequency checks and repairs.

SPECIFICATIONS:

Range:	1 MHz to 500 MHz
Sensitivity:	Less than 25 MV
Resolution:	100 Hz (slow gate) 1.0 KHz (fast gate)
Display:	7 digits, 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	5 VDC @ 200 ma

8 DIGITS 600 MHz $159.95 WIRED

NEW READ RECEIVER FREQUENCY

SPECIFICATIONS:

Range:	20 Hz to 600 MHz
Sensitivity:	Less than 25 mv to 150 MHz Less than 150 mv to 600 MHz
Resolution:	1.0 Hz (60 MHz range) 10.0 Hz (600 MHz range)
Display:	8 digits 0.4" LED
Time base:	2.0 ppm 20-40°C
Power:	110 VAC or 12 VDC

The CT-50 is a versatile lab bench counter that will measure up to 600 MHz with 8 digit precision. And, one of its best features is the Receive Frequency Adapter, which turns the CT-50 into a digital readout for any receiver. The adapter is easily programmed for any receiver and a simple connection to the receiver's VFO is all that is required for use. Adding the receiver adapter in no way limits the operation of the CT-50, the adapter can be conveniently switched on or off. The CT-50, a counter that can work double-duty!

PRICES:

CT-50 wired, 1 year warranty	$159.95
CT-50 Kit, 90 day parts warranty	119.95
RA-1, receiver adapter kit	14.95
RA-1 wired and pre-programmed (send copy of receiver schematic)	29.95

DIGITAL MULTIMETER $99.95 WIRED

PRICES:

DM-700 wired, 1 year warranty	$99.95
DM-700 Kit, 90 day parts warranty	79.95
AC-1, AC adaptor	3.95
BP-3, Nicad pack +AC adapter/charger	19.95
MP-1, Probe kit	2.95

The DM-700 offers professional quality performance at a hobbyist price. Features include; 26 different ranges and 5 functions, all arranged in a convenient, easy to use format. Measurements are displayed on a large 3½ digit, ½ inch LED readout with automatic decimal placement, automatic polarity, overrange indication and overload protection up to 1250 volts on all ranges, making it virtually goof-proof! The DM-700 looks great, a handsome, jet black, rugged ABS case with convenient retractable tilt bail makes it an ideal addition to any shop.

SPECIFICATIONS:

DC/AC volts:	100uV to 1 KV, 5 ranges
DC/AC current:	0.1uA to 2.0 Amps, 5 ranges
Resistance:	0.1 ohms to 20 Megohms, 6 ranges
Input impedance:	10 Megohms, DC/AC volts
Accuracy:	10.1% basic DC volts
Power:	4 'C' cells

AUDIO SCALER

For high resolution audio measurements, multiplies UP in frequency.

- Great for PL tones
- Multiplies by 10 or 100
- 0.01 Hz resolution!

$29.95 Kit $39.95 Wired

ACCESSORIES

Telescopic whip antenna - BNC plug	$ 7.95
High impedance probe, light loading	15.95
Low pass probe, for audio measurements	15.95
Direct probe, general purpose usage	12.95
Tilt bail, for CT 70, 90, MINI-100	3.95
Color burst calibration unit, calibrates counter against color TV signal	14.95

COUNTER PREAMP

For measuring extremely weak signals from 10 to 1,000 MHz. Small size, powered by plug transformer-included.

- Flat 25 db gain
- BNC Connectors
- Great for sniffing RF with pick-up loop

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- Use with any exciter; works with input levels as low as 1 mW.
- Use low power tap on exciter or simple resistor attenuator pad (instructions included).
- Link osc with RX converter for transceive.

XV4 UHF KIT — ONLY $99.95

28-30 MHz in, 435-437 MHz out; 1W p.e.p. on ssb, up to 1½W on CW or FM. Has second oscillator for other ranges. Atten. supplied for 1 to 500 mW input, use external attenuator for higher levels.

Extra crystal for 432-434 MHz range.....$5.95
XV4 Wired and tested $149.95

XV2 VHF KIT - ONLY $69.95

2W p.e.p. output with as little as 1mW input. Use simple external attenuator. Many freq. ranges available.

MODEL	INPUT (MHz)	OUTPUT (MHz)
XV2-1	28-30	50-52
XV2-2	28-30	220-222
XV2-4	28-30	144-146
XV2-5	28-29 (27-27.4 CB)	145-146 (144-144.4)
XV2-7	144-148	50-52

XV2 Wired and tested $109.95

XV28 2M ADAPTER KIT - $24.95

Converts any 2M exciter to provide the 10M signal required to drive above 220 or 435 MHz units.

NEW! COMPLETE TRANSMITTING CONVERTER AND PA IN ATTRACTIVE CABINET

Far less than the cost of many 10W units!

Now, the popular Hamtronics® Transmitting Converters and heavy duty Linear Power Amplifiers are available as complete units in attractive, shielded cabinets with BNC receptacles for exciter and antenna connections. Perfect setup for versatile terrestial and OSCAR operations! Just right for phase 3! You save $30 when you buy complete unit with cabinet under cost of individual items. Run 40-45 Watts on VHF or 30-40 Watts on UHF with one integrated unit! Call for more details.

MODEL	KIT	WIRED and TESTED
XV2/LPA2-45/Cabt (6,2,or220)	$199.95	$349.95
XV4/LPA4-30/Cabt (for UHF)	$229.95	$399.95

Easy to Build FET RECEIVING CONVERTERS

Let you receive OSCAR and other exciting VHF and UHF signals on your present HF or 2M receiver

- NEW LOW-NOISE DESIGN
- ATTRACTIVE WOODGRAIN CASE
- Less than 2dB noise figure, 20dB gain

MODEL	RF RANGE	OUTPUT RANGE
CA28	28-32 MHz	144-148 MHz
CA50	50-52	28-30
CA50-2	50-54	144-148
CA144	144-146	28-30
CA145	145-147-or-144-144.4	28-30 27-27.4 (CB)
CA146	146-148	28-30
CA220	220-222	28-30
CA220-2	220-224	144-148
CA110	Any 2MHz of Aircraft Band	26-28 or 28-30
CA432-2	432-434	28-30
CA432-5	435-437	28-30
CA432-4	432-436	144-148

Easily modified for other rf and if ranges.

STYLE	VHF	UHF
Kit less case	$34.95	$49.95
Kit with case	$39.95	$54.95
Wired/Tested in case	$54.95	$64.95

Professional Quality VHF/UHF FM/CW EXCITERS

- Double tuned circuits for spurious suppression
- Easy to align with built-in test aids

T51-30	10 Meter, 2W Kit	$44.95
T51-50	6 Meter, 2W Kit	$44.95
T51-150	2 Meter, 2W Kit	$44.95
T51-220	220 MHz, 2W Kit	$44.95
T450	450 MHz, 3/4W Kit	$44.95
T451	450 MHz, 3 W Kit	$59.95
A14T	5 Chan Adapter (T51&T451)	$9.95

See our Complete Line of VHF & UHF Linear PA's

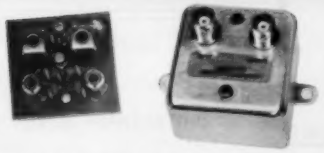
- Use as linear or class C PA
- For use with SSB Xmtg Converters, FM Exciters, etc.

LPA2-15	6M, 2M, 220; 15 to 20W	$59.95
LPA2-30	6M, 2m; 25 to 30W	$89.95
LPA2-40	220 MHz; 30 to 40W	$119.95
LPA2-45	6M, 2M; 40 to 45W	$119.95
LPA4-10	430MHz; 10 to 14W	$79.95
LPA4-30	430MHz; 30-40W	$119.95

See catalog for complete specifications

FAMOUS HAMTRONICS PREAMPS

Let you hear the weak ones too!
Great for OSCAR, SSB, FM, ATV. Over 14,000 in use throughout the world on all types of receivers.



- NEW LOW-NOISE DESIGN
- Less than 2 dB noise figure, 20 dB gain
- Case only 2 inches square
- Specify operating frequency when ordering

MODEL P-30 VHF PREAMP, available in many versions to cover bands 28-300 MHz.

MODEL P432 UHF PREAMP, available in versions to cover bands 300-650 MHz.

STYLE	VHF	UHF
Kit less case	$12.95	$18.95
Kit with case	$18.95	$26.95
Wired/Tested in Case	$27.95	$32.95

NEW VHF/UHF FM RCVRS

Offer Unprecedented Range of Selectivity Options

- New generation
- More sensitive
- More selective
- Low cross mod
- Uses crystal filters
- Smaller
- Easy to align

R75A* VHF Kit for monitor or weather sattelite service. Uses wide L-C filter. -60dB at ± 30 kHz.....$69.95

R75B* VHF Kit for normal nbfm service. Equivalent to most transceivers. -60dB at ± 17 kHz, -80dB at ± 25 kHz...$74.95

R75C* VHF Kit for repeater service or high rf density area. -60dB at ±14kHz, -80dB ±22kHz, -100dB ±30kHz....$84.95

R75D* VHF Kit for split channel operation or repeater in high density area. Uses 8-pole crystal filter. -60dB at ±9 kHz, -100dB at ± 15 kHz. The ultimate receiver!...$99.95

* Specify band: 10M, 6M, 2M, or 220 MHz. May also be used for adjacent commercial bands. Use 2M version for 137 MHz WX satellites.

R450( ) UHF FM Receiver Kits, similar to R75, but for UHF band. New low-noise front end. Add $10 to above prices. (Add selectivity letter to model number as on R75.)

A14 5 Channel Adapter for Receivers.....$9.95

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AM monitor receiver kit similar to R75A, but AM. Available for 10-11M, 6M, 2M, 220 MHz, and 110-130 MHz aircraft band $74.95. (Also available in UHF version.)

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2117/4116	16K x 1 Dynamic Ram	5.00
2732-6	32K Eprom	39.95

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MC68B21P	PIA	6.99
MC6845P	CRT Controller	25.00
MC6850P	ACIA	4.99
MC6852P	SSDA	5.00
8008-1	Microprocessor	5.00
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Z80A	Microprocessor	10.99
Z80	Microprocessor	8.99
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10.7 MHz narrow Band
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Ultimate 50 dB insertion loss 1 dB max.
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MRF422A	38.25
MRF422	38.25
MRF428	38.25
MRF428A	38.25
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MRF449	10.61
MRF449A	10.61
MRF450	11.00
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MRF453	13.72
MRF454	21.83
MRF454A	21.83
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MRF474	3.00
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MRF485	3.00
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BFR91	1.25
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MMCM2369	15.00
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MMCM3960A	24.30
MWA110	6.92
MWA120	7.38
MWA130	8.08
MWA210	7.46
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8950	9.00
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1900 MHz to 2500 MHz DOWNCONVERTERS
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Gold plated contacts
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Solder tail for PCB $3.00 each

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Reader Service—see page 82

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2822 North 32nd Street, #1 • Phoenix, Arizona 85008 • Phone 602-956-9423 ~84

2N2857JAN	$ 2.50
2N2949	3.60
2N2947	15.00
2N2950	4.60
2N3375	8.00
2N3553	1.57
2N3818	5.00
2N3866	1.00
2N3866JAN	2.50
2N3866JANTX	4.00
2N3925	10.00
2N3948	2.00
2N3950	25.00
2N3959	3.00
2N3960JANTX	10.00
2N4072	1.60
2N4427	1.10
2N4429	7.00
2N4877	1.00
2N4959	2.00
2N4976	15.00
2N5070	8.00
2N5071	15.00
2N5108	4.00
2N5109	1.50
2N5179	1.00
2N5583	4.00
2N5589	6.00
2N5590	8.00
2N5591	11.00
2N5635	5.44
2N5636	11.60
2N5637	20.00
2N5641	5.00
2N5643	14.00
2N5645	10.00
2N5842	8.00
2N5849	20.00
2N5942	40.00
2N5946	14.00
2N5862	50.00
2N6080	7.00
2N6081	10.00
2N6082	11.00
2N6083	13.00
2N6084	14.00
2N6095	11.00
2N6096	20.00
2N6097	$28.00
2N6166	38.00
2N6368	22.99
2N6439	40.00
A210/MRF517	2.00
BLY38	5.00
40280/2N4427	1.10
40281/2N3920	7.00
40282/2N3927	10.48

NE555V TIMERS
39¢ each or 10/$3.00

NEW DUAL COLON LED
69¢ each or
10/$5.00

HEP170 1000 PIV
2.5 Amps 25¢ each or
100/$15.00

HIGH VOLTAGE CAPS
420 MFD @ 400 VDC OR
600 MFD @ 400 VDC
$6.99 each

NEW ROTRON BISCUIT FANS
Model BT2A1 115 VAC
$12.99 each

TORIN TA700 FANS NEW
Model A30340
230 VAC @ .78 Amps
Will also work on 115 VAC
$29.99 each

DOOR KNOB CAPS

470 pf @ 15 KV	$3.99 each
Dual 500 pf @ 15 KV	5.99 each
680 pf @ 6 KV	3.99 each
800 pf @ 15 KV	3.99 each
1000 pf @ 20 KV	5.00 each
2700 pf @ 40 KV	5.99 each

NEW & USED BCD SWITCHES
3 switch with end plates
New $8.99
Used $6.95

ORDERING INSTRUCTIONS

Check, money order, or credit cards welcome. (Mastercharge and VISA only) No personal checks or certified personal checks for foreign countrys accepted. Money order or cashiers check in U.S. funds only. Letters of credit are not acceptable.

Minimum shipping by UPS is $2.35 with insurance. Please allow extra shipping charges for heavy or long items.

All parts returned due to customer error will be subject to a 15% restock charge.

If we are out of an item ordered, we will try to replace it with an equal or better part unless you specify not to, or we will back order the item, or refund your money.

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE. Prices superseade all previously published. Some items offered are limited to small quantities and are subject to prior sale.

We now have a toll free number but we ask that it be used for CHARGE ORDERS ONLY. If you have any questions please use our other number. We are open from 8:00 a.m. - 5:00 p.m. Monday thru Saturday.

Our toll free number for orders only is 800-528-3611.

JUMBO LED's

Red	8/$1.00
Clear	6/$1.00
Yellow	6/$1.00
Green	6/$1.00
Amber	6/$1.00

MEDIUM LED's

Red	6/$1.00
Green	6/$1.00

NEW G.E. OPTO COUPLERS 4N26
69¢ each or 10/$5.00

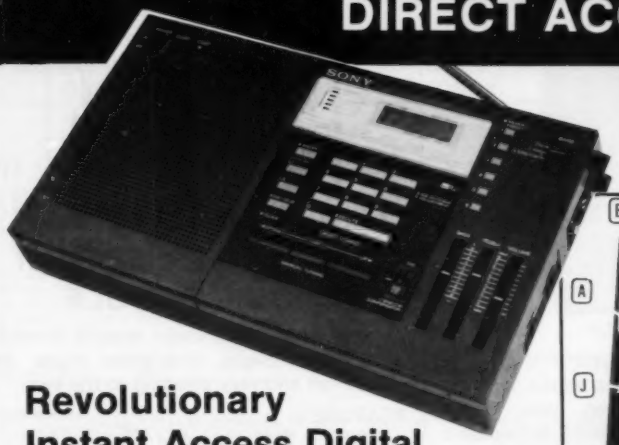
MICRO-MINI WATCH CRYSTALS
32.768 Hz $3.00 each

NEW 2 inch ROUND SPEAKERS
100 Ohm coil 99¢ each

PLASTIC TO-3 SOCKETS 4/$1.00

NO ORDERS UNDER $10

INTRODUCING SONY'S NEW DIGITAL DIRECT ACCESS RECEIVER!



only **$299.95** plus $5.00 shipping

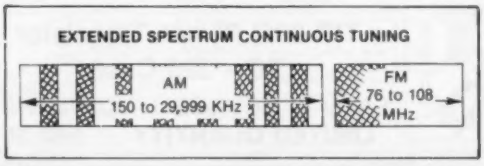
Revolutionary Instant Access Digital Shortwave Scanner

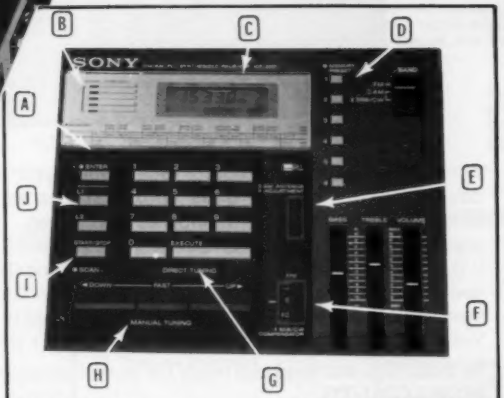
- **Continuous Scanning of LW, MW, SW, & FM Bands**
- **Instant Fingertip Tuning—No More Knobs!**
- **6 Memories for Any Mode (AM,SSB/CW, & FM)**
- **Dual PLL Frequency Synthesized—No Drift!**

A WHOLE NEW BREED OF RADIO IS HERE NOW! No other short wave receiver combines so many advanced features for both operating convenience and high performance as does the new Sony ICF-2001. Once you have operated this exciting new radio, you'll be spoiled forever! Direct access tuning eliminates conventional tuning knobs and dials with a convenient digital keyboard and Liquid Crystal Display (LCD) for accurate frequency readout to within 1 KHz. Instant fingertip tuning, up to 8 memory presets, and continuous scanning features make the ICF-2001 the ultimate in convenience.

Compare the following features against any receiver currently available and you will have to agree that the Sony ICF 2001 is the best value in shortwave receivers today:

DUAL PLL SYNTHESIZER CIRCUITRY covers entire 150 KHz to 29.999 MHz band. PLL_1 circuit has 100 KHz step while PLL_2 handles 1 KHz step, both of which are controlled by separate quartz crystal oscillators for precise, no-drift tuning. **DUAL CONVERSION SUPERHETERODYNE** circuitry assures superior AM reception and high image rejection characteristics. The 10.7 MHz IF of the FM band is utilized as the 2nd IF of the AM band. A new type of crystal filter made especially for this purpose realizes clearer reception than commonly used ceramic filters. **ALL FET FRONT END** for high sensitivity and interference rejection. Intermodulation, cross modulation, and spurious interference are effectively rejected. **FET RF AMP** contributes to superior image rejection, high sensitivity, and good signal to noise ratio. Both strong and weak stations are received with minimal distortion.





- **A** Enter Button
- **B** Signal Strength Indicator
- **C** Liquid Crystal Display
- **D** Memory Preset Buttons
- **E** Antenna Adjustment Dial
- **F** SSB/CW Compensator
- **G** Execute Bar
- **H** Manual Tuning Buttons
- **I** Scan Button
- **J** High/Low Limit Buttons

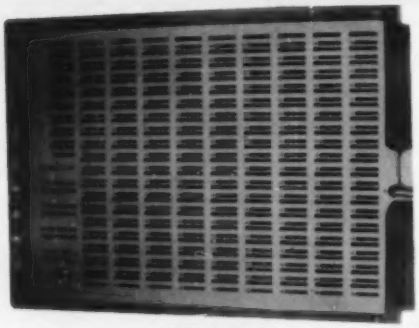
OPERATIONAL FEATURES

INSTANT FINGERTIP TUNING with the calculator-type key board enables the operator to have instant access to any frequency in the LW, MW, SW, and FM bands. And the LCD digital frequency display confirms the exact, drift-free signal being received. **AUTOMATIC SCANNING** of the above bands. Continuous scanning of any desired portion of the band is achieved by setting the "L_1" and "L_2" keys to define the range to be scanned. The scanner can stop automatically on strong signals, or it can be done manually. **MANUAL SEARCH** is similar to the manual scan mode and is useful for quick signal searching. The "UP" and "DOWN" keys let the tuner search for you. The "FAST" key increases the search rate for faster signal detection. **MEMORY PRESETS.** Six memory keys hold desired stations for instant one-key tuning in any mode (AM, SSB/CW, and FM), and also, the "L_1" and "L_2" keys can give you two more memory slots when not used for scanning. **OTHER FEATURES:** Local, normal, DX sensitivity selector for AM; SSB/CW compensator; 90 min. sleep timer; AM Ant. Adjust.

SPECIFICATIONS

CIRCUIT SYSTEM: Fm Superheterodyne; AM Dual conversion superheterodyne. **SIGNAL CIRCUITRY:** 4 IC's, 11 FET's, 23 Transistors, 16 Diodes. **AUXILIARY CIRCUITRY:** 5 IC's, 1 LSI, 5 LED's, 25 Transistors, 9 Diodes. **FREQUENCY RANGE:** FM 76-108 MHz; AM 150-29,999 KHz. **INTERMEDIATE FREQUENCY:** FM 10.7 MHz.; AM 1st 66.35 MHz., 2nd 10.7 MHz. **ANTENNAS:** FM telescopic, ext. ant. terminal; AM telescopic, built-in ferrite bar, ext. ant. terminal. **POWER:** 4.5 VDC/120 VAC **DIMENSIONS:** 12¼ (W) X 2¼ (H) X 6¾ (D). **WEIGHT:** 3 lb. 15 oz. (1.8 kg)

SPECTRONICS, INC.
1009 GARFIELD ST. OAK PARK, IL. 60304
PHONE (312) 848-6777



AUGAT

Wire wrap prototyping board. Board measures 17½ by 11½ double sided 1/16 inch glass epoxy. Silk screened top and bottom with all pins numbered on wrap side. Board accommodates 2 - 24 Pin and 326 - 14 or 16 Pin I.C.'s. Separate V.C.C. and Ground Pin above each I.C. (V.C.C. and Ground are not dedicated, therefore, you may use 16, 14, 8 Pin Dips.) All inner sleeves gold plated as are the two dual 86 Pin edge connectors. Very limited stock so please order NOW. DRC's price **$19.95.**

All boards guaranteed and ready for immediate shipment. Augat #8136-LG761-TG.

Blank board (same as above) with V.C.C., ground plane, edge connectors, no wire wrap pins. Insert your own wire wrap sockets.

$8.50

GOLD WIRE WRAP SOCKETS

Fit panel above. Not gold inlay as sold by others. Super 3 level gold wire wrap.

14 Pin — 10/$3.95 25/$8.75

16 Pin — 10/$4.95 25/$11.25

SUPER CUSTOM IC #17564-4

Has a C-MOS oscillator, Decade Counter Decoder/ Driver. At the push of a button will flash a LED 24 times. At the end of which it will display the number of times it has gone through the cycle, up to 99. Variable speed pulses - Perfect for timing. FULL DATA — **$1.00**

PUSH BUTTON SWITCH

Normally Closed

6/$1.25

MICROWAVE DIODE

For Down Converters

5082 - 2835 **$1.50 or 5 For $6.00**

LAB-BENCH VARIABLE POWER SUPPLY KIT **$12.00 KIT SUPER SALE**

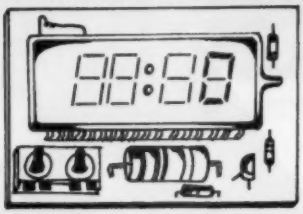
5 to 20 VDC at 1 AMP. Short circuit protected by current limit. Uses IC regulator and 10 AMP Power Darlington. Very good regulation and low ripple. Kit includes PC Board, all parts, large heatsink and shielded transformer. 50 MV. TYP. Regulation.

RCA SENSITIVE GATE TRIAC

TO-5 CASE. HOUSE #40531 ALSO SAME AS T2300D. 2.5 AMPS 400 PIV

5/$1.19

Perfect for Dimmers, Color Organs, etc. PC LEADS



Digital Research Exclusive 4 DIGIT FLUORESCENT CLOCK MODULE

A super fantastic car clock module, or desk clock. Four bright, blue-green digits .33 inches tall and very pleasing to the eye.

FEATURES:

- CMOS - 3MA Max. Current
- Display can be dimmed
- Display Off, but clock continues to count
- Crystal controlled accuracy
- Small physical size 2½ x 2 x 5/8
- On-Board hours and minute set switches

All you need to make this exceptional time piece work is + 12VDC.

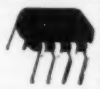
12 Hour Model - $5.95 or 3/$15.00

24 Hour Model - $6.95 or 3/$18.00

REPEAT OF A SELL-OUT

4558 - Dual 741 in 8 Pin Mini Dip

4 for $1.20



JFET OP AMP

Super High Input Impedance (10^{12} OHMS) — High Frequency Response. TO 4 MHZ. Large DC Voltage Gain 106 DB — New Generation OP-AMP with Vastly Superior Features!

LF356BH - 75¢ or 3/$2.00 By National

$4.95

60 Hz CRYSTAL TIME BASE (Complete Kit)

Uses MM5369 CMOS divider IC with high accuracy 3.579545 MHZ Crystal. Use with all MOS Clock Chips or Modules. Draws only 1.5 MA. All parts, data and PC Board included. 100 Hz, same as above, except **$5.95.**

D.C. HORN

VERY LOUD!

6-12 VDC

Like Used In Smoke Alarms.

FANTASTIC SAVINGS.

Compare this true value.

.60 ea. 4 For $2.00

PMD-11K-60 (Darlington)

60 Volts. HFE 800-20K

12 Amps. PNP TO-3

150 Watts. By Lambda.

$1.50 **BRAND NEW!**

BRAND NEW!

NE555V

3/$1.25

10/$3.30

TIP 29C Power Transistor

TO - 220 Case

1 Amp 30 Watts 100 Volt NPN

LIMITED QUANTITY 3/$1.25

Digital Research: Parts

(OF TEXAS)

P.O. BOX 401247 • GARLAND, TEXAS 75040 • (214) 271-2461

TERMS: Add 50¢ postage, we pay balance. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa, MasterCharge and American Express cards. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P&H. 90 Day Money Back Guarantee on all items.

RAMSEY ELECTRONIC'S Inc.

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PARTS WAREHOUSE

We now have available a bunch of goodies too good to bypass. Items are limited so order today

2575 Baird Rd.
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Call Your Phone Order in Today
TERMS: Satisfaction guaranteed or money refunded. C.O.D. add $2.00. Minimum order $6.00. Orders under $10.00 add $1.50. Add 5% for postage, insurance, handling. Overseas add 15%. N.Y. residents add 7% tax.

MINI KITS - YOU HAVE SEEN THESE BEFORE NOW HERE ARE OLD FAVORITE AND NEW ONES TOO. GREAT FOR THAT AFTERNOON HOBBY.

FM MINI MIKE

A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.

FM-3 Kit **$14.95**
FM-3 Wired and Tested **15.95**

Color Organ

See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110 VAC.

Complete kit, ML-1 **$8.95**

Video Modulator Kit

Converts any TV to video monitor. Super stable, tunable over ch. 4-6. Runs on 5-15V, accepts std. video signal. Best unit on the market! Complete kit, VD-1 **$7.95**

Led Blinky Kit

A great attention getter which alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights, anything! Runs on 3 to 15 volts. Complete kit, BL-1 **$2.95**

Super Sleuth

A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2 W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker. Complete kit, BN-9 **$5.95**

CPO-1

Runs on 3-12 Vdc 1 watt out, 1 KHZ good for CPO, Alarm, Audio Oscillator. Complete kit **$2.95**

FM Wireless Mike Kit

Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.

FM-1 kit **$3.95** FM-2 kit **$4.95**

Whisper Light Kit

An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC.

Complete kit, WL-1 **$6.95**

Tone Decoder

A complete tone decoder on a single PC board. Features: 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts. Complete kit, TD-1 **$5.95**

Universal Timer Kit

Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.

UT-5 Kit **$5.95**

Mad Blaster Kit

Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC

MB-1 Kit **$4.95**

Siren Kit

Produces upward and downward wail characteristic of a police siren. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.

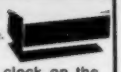
Complete kit, SM-3 **$2.95**

60 Hz Time Base

Runs on 5-15 VDC. Low current (2.5ma). 1 min/month accuracy. TB-7 Kit **$5.50**
TB-7 Assy. **$9.95**

CLOCK KITS

Your old favorites are here again. Over 7,000 Sold to Date. Be one of the gang and order yours today!



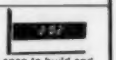
Try your hand at building the finest looking clock on the market. Its satin finish anodized aluminum case looks great anywhere, while six .4" LED digits provide a highly readable display. This is a complete kit, no extras needed, and it only takes 1-2 hours to assemble. Your choice of case colors: silver, gold, black (specify).

Clock kit, 12/24 hour, DC-5 **$24.95**
Clock with 10 min. ID timer, 12/24 hour, DC-10 **$29.95**
Alarm clock, 12 hour only, DC-8 **$29.95**
12V DC car clock, DC-7 **$29.95**

For wired and tested clocks add $10.00 to kit price.
SPECIFY 12 OR 24 HOUR FORMAT

Car Clock

The UN-KIT, only 5 solder connections



Here's a super looking, rugged and accurate auto clock, which is a snap to build and install. Clock movement is completely assembled — you only solder 3 wires and 2 switches, takes about 15 minutes! Display is bright green with automatic brightness control photocell — assures you of a highly readable display day or night. Comes in a satin finish anodized aluminum case which can be attached 5 different ways using 2 sided tape. Choice of silver, black or gold case (specify)

DC-3 kit, 12 hour format **$22.95**
DC-3 wired and tested **$29.95**

Calendar Alarm Clock

The clock that's got it all: 6- 5" LEDs, 12/24 hour, snooze, 24 hour alarm, 4 year calendar, battery backup, and lots more. The super 7001 chip is used. Size: 5x4x2 inches. Complete kit, less case (not available)
DC-9 **$34.95**

Under Dash Car Clock

12/24 hour clock in a beautiful plastic case features 6 jumbo RED LEDS, high accuracy (.001%), easy 3 wire hookup, display blanks with ignition, and super instructions. Optional dimmer atuomatically adjusts display to ambient light level.
DC-11 clock with mtg. bracket **$27.95 kit**
DM-1 dimmer adapter **$2.50**
Add $10.00 Assy. and Test

Video Terminal

A completely self-contained, stand alone video terminal card. Requires only an ASCII keyboard and TV set to become a complete terminal unit. Features are: single 5V supply, XTAL controlled sync and baud rates (to 9600), complete computer and keyboard control of cursor. Parity error control and display. Accepts and generates serial ASCII plus parallel keyboard input. The 6416 is 64 char. by 16 lines with scrolling, upper and lower case (optional) and has RS-232 and 20ma loop interfaces on board. Kits include sockets and complete documentation.

RE 6416 terminal card kit (add $80.00 for wired unit) **$180.95**
Lower Case option **$13.95**
Power Supply **$14.95**
RF Modulator kit **$7.95**

PARTS PARADE

IC SPECIALS

LINEAR

301	$ .35
324	$1.50
380	$1.50
555	$ .45
556	$1.00
565	$1.00
566	$1.00
567	$1.25
741	10/$2.00
1458	$ .50
3900	$ .50
3914	$2.95
8038	$2.95

CMOS

4011	.50
4013	.50
4046	$1.85
4049	.50
4059	$9.00
4511	$2.00
4518	$1.35
5639	$1.75

TTL

74S00	$ .40
7447	$ .65
7475	$ .50
7490	$ .50
74196	$1.35

SPECIAL

11C90	$15.00
10116	$ 1.25
7208	$17.50
7207A	$ 5.50
7216D	$21.00
7107C	$12.50
5314	$ 2.95
5375AB/G	$ 2.95
7001	$ 6.50

FERRITE BEADS

With info and specs. **15/$1.00**
6 Hole Balun Beads **5/$1.00**

READOUTS

FND 359 .4" C.C.	$1.00
FND 507/510 .5" C.A.	1.00
MAN 72/HP7730 .33" C.A.	1.00
HP 7651 .43" C.A.	2.00

TRANSISTORS

2N3904 NPN C+F	15/$1.00
2N3906 PNP C+F	15/$1.00
2N4403 PNP C+F	15/$1.00
2N4410 NPN C+F	15/$1.00
2N4916 FET C+F	4/$1.00
2N5401 PNP C+F	5/$1.00
2N6028 C+F	4/$1.00
2N3771 NPN Silicon	$1.00
2N5179 UHF NPN	3/$2.00
Power Tab NPN 40W	3/$1.00
Power Tab PNP 40W	3/1.00
MPF 102/2N5484	$.90
NPN 3804 Type T+R	50/$3.50
PNP 3906 Type T+R	50/$3.50
2N3055	$.90
2N2646 UJT	3/$2.00

Sockets

8 Pin	10/$2.00
14 Pin	10/$2.00
16 Pin	10/$2.00
24 Pin	4/$2.00
28 Pin	4/$2.00
40 Pin	3/$2.00

Diodes

5.1 V Zener	20/$1.00
1N914 Type	50/$1.00
1KV 2Amp	8/$1.00
100V 1Amp	15/$1.00

25 AMP 100V Bridge **$1.50 each**

Mini-Bridge 50V 1 AMP 2 for $1.00

Resistor Ass't

Assortment of Popular values - ¼ watt. Cut lead for PC mounting, ½" center, ½" leads, bag of 300 or more. **$1.50**

Switches

Mini toggle SPDT **$1.00**
Red Pushbuttons N.O. **3/$1.00**

Earphones

3" leads, 8 ohm, good for small tone speakers, alarm clocks, etc.
5 for $1.00

Mini 8 ohm Speaker

Approx 2"x" diam. Round type for radios, mike etc.
3 for $2.00

Slug Tuned Coils

Small 3/16" Hex. Slugs turned coil. 3 turns.
10 for $1.00

CAPACITORS

TANTALUM Dipped Epoxy	ALUMINUM Electrolytic	DISK CERAMIC
1.5 uF 25V 3/$1.00	1000 uF 16V Radial $.50	1 16V disk 20/$1.00
1.8 uF 25V 3/$1.00	500 uF 20V Axial $.50	.001 16V 20/$1.00
.22 uF 25V 3/$1.00	150 uF 16V Axial 5/$1.00	100 pF 20/$1.00
	10 uF 15V Radial 10/$1.00	.047 16V 20/$1.00

DC-DC Converter

+5 vdc input prod. -9 vdc @ 30ma
+9 vdc produces -15 vdc @ 35ma **$1.25**

Trimmer Pots

25K 20 Turn Trim Pot **$1.00**
1K 20 Turn Trim Pot **$.50**

Trimmer Caps

Sprague - 3-40 pf Stable Polypropylene **.50 ea.**

Crystal Microphone

Small 1" diameter ¼" thick crystal mike cartridge **$.75**

Coax Connector

Chassis mount BNC type **$1.00**

Parts Bag

Asst. of chokes, disc caps, tant. resistors, transistors, diodes, MICA caps etc. sm. bag (100 pc) **$1.00** lg. bag (300 pc) **$2.00**

Leds

- your choice, please specify
Mini Red, Jumbo Red, High Intensity Red, Illuminator Red **6/$1**
Mini Yellow, Jumbo Yellow, Jumbo Green **6/$1**

Varactors

Motorola MV 2209 30 PF Nominal cap 20-80 PF - Tunable range - **.50 each or 3/$1.00**

Crystals

3.579545 MHZ	$1.50
10.00000 MHZ	$5.00
5.248800 MHZ	$5.00

AC Adapters

Good for clocks, nicad chargers, all 110 VAC plug one end

8.5 vdc @ 20 mA	$1.00
16 vac @ 160mA	$2.50
12 vac @ 250mA	$3.00

Solid State Buzzers

small buzzer 450 Hz. 86 dB. sound output on 5-12 vdc at 10-30 mA. TTL compatible **$1.50**

AC Outlet

Panel Mount with Leads
4/$1.00

Ceramic IF Filters

Mini ceramic filters 7 kHz B.W. 455 kHz $1.50 ea.

Mini RG-174 Coax

10 ft. for $1.00

9 Volt Battery Clips

Nice quality clips **5 for $1.00**
¼" Rubber Grommets **10 for $1.00**

Connectors

6 pin type gold contacts for mA-1003 car clock module price **.75 ea.**

Audio Prescaler

Make high resolution audio measurments, great for musical instrument tuning, PL tones, etc. Multiplies audio UP in frequency, selectable x10 or x100, gives .01 HZ resolution with 1 sec. gate time! High sensitivity of 25 mv, 1 meg input z and built-in filtering gives great performance. Runs on 9V battery, all CMOS.

PS-2 kit **$29.95**
PS-2 wired **$39.95**

600 MHz PRESCALER

Extend the range of your counter to 600 MHz. Works with all counters. Less than 150 mv sensitivity, specify -10 or -100

Wired, tested, PS-1B **$59.95**
Kit, PS-1B **$44.95**

30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 W in for 15 out, 4W in for 30 out. Max output of 35 W, incredible value, complete with all parts, less case and T-R relay.

PA-1, 30 W pwr amp kit **$22.95**
TR-1, RF sensed T-R relay kit **6.95**

MRF-238 transistor as used in PA-1 8-10db gain 150 mhz **$11.95**

RF actuated relay senses RF (1W) and closes DPDT relay. For RF sensed T-R relay
TR-1 Kit **$6.95**

Power Supply Kit

Complete triple regulated power supply provides variable 6 to 18 volts at 200 ma and +5 at 1 Amp. Excellent load regulation, good filtering and small size. Less transformers, requires 6.3 V @ 1 A and 24 VCT.
Complete kit, PS-3LT **$6.95**

OP-AMP Special

BI-FET LF 13741 - Direct pin for pin 741 compatible, but 500,000 MEG input z, super low 50 pa input current, low power drain.
50 for only $9.00 **10 for $2.00**

Regulators

78MG	$1.25	7812	$1.00
79MG	$1.25	7815	$1.00
723	$.50	7905	$1.25
309K	$1.15	7912	$1.25
7805	$1.00	7915	$1.25

Shrink Tubing Nuke

Nice precut pces of shrink size 1" x ½" shrink to ¼". Great for splices. **50/$1.00**

Mini TO-92 Heat Sinks

Thermalloy Brand **5 for $1.00**
To-220 Heat Sinks **3 for $1.00**

Opto Isolators - 4N28 type **$.50 ea.**

Opto Reflectors - Photo diode + LED **$1.00 ea.**

Molex Pins

Molex already precut in length of 7. Perfect for 14 pin sockets. **20 strips for $1.00**

CDS Photocells

Resistance varies with light, 250 ohms to over 3 meg **3 for $1.00**

Save on Scanners!

NEW Rebates!

Communications Electronics,™ the world's largest distributor of radio scanners, celebrates Father's Day early with big savings on *Bearcat* scanners. Electra Company, the manufacturers of *Bearcat* scanners is offering consumer rebates on their great line of scanners, when purchased between April 1 and May 15, 1981.

With a scanner, you can monitor the exciting two-way radio conversations of police and fire departments, intelligence agencies, mobile telephones, energy/oil exploration crews, and more. Some scanners can even monitor aircraft transmissions! You can actually hear the news *before* it's news. If you do not own a scanner yourself, now's the time to buy your scanner from **Communications Electronics**. Choose the scanner that's right for you, then call our *toll-free* number to place your order with your Visa or Master Charge.

We give you excellent service because **CE** distributes more scanners worldwide than *anyone* else. Our warehouse facilities are equipped to process thousands of scanner orders every week. We also export scanners to over 300 countries and military installations. Almost all items are **in stock** for **quick shipment**, so if you're a person who prefers fact to fantasy and who needs to know what's *really* happening around you, order your scanner today from **CE**!

NEW! Bearcat®‡ 350

The Ultimate Synthesized Scanner!

Allow 120-240 days for delivery after receipt of order due to the high demand for this product.

List price $599.95/**CE price $419.00**

4-Band, 50 Channel • Alpha-Numeric • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC

Bands: 30-50, 118-136 AM, 144-174, 421-512 MHz.

The new *Bearcat* 350 introduces an incredible breakthrough in synthesized scanning: Alpha-Numeric Display. Push a button—and the Vacuum Fluorescent Display switches from "numeric" to word descriptions of what's being monitored. 50 channels in 5 banks. Plus, Auto & Manual Search, Search Direction, Limit & Count. Direct Channel Access. Selective Scan Delay. Dual Scan Speeds. Automatic Lockout. Automatic Squelch. Non-Volatile Memory. Reserve your *Bearcat* 350 today!

Bearcat® 300

List price $549.95/**CE price $349.00/$25.00 rebate**
Your final cost is a low $324.00

4-Band, 50 Channel • Service Search • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC

Bands: 32-50, 118-136 AM, 144-174, 421-512 MHz.

The *Bearcat* 300 is the most advanced automatic scanning radio that has ever been offered to the public. The *Bearcat* 300 uses a bright green fluorescent digital display, so it's ideal for mobile applications. The *Bearcat* 300 now has these added features: Service Search, Display Intensity Control, Hold Search and Resume Search keys, Separate Band keys to permit lock-in/lock-out of any band for more efficient service search.

NEW! Bearcat® 350

FREE Bearcat® Rebate Offer

Get a coupon good for a $25 rebate when you purchase a *Bearcat* 300, 250, 220 or 210XL; $20 rebate on model 160; $10 rebate on model Four-Six Thin Scan and $5 rebate on the *Bearcat* 5. To get your rebate, mail this coupon with your original dated sales receipt and the *Bearcat* model number from the carton to Electra. You'll receive your rebate in four to six weeks. Offer valid only on purchases made betwen April 1, 1981 and May 15, 1981. All requests must be postmarked by May 30, 1981. Limit of one rebate per household. Coupon must accompany all rebate requests and may not be reproduced. Offer good only in the U.S.A. Void where taxed or prohibited by law. Resellers, companies, clubs and organizations–both profit and non-profit–are not eligible for rebates. Employees of Electra Company, their advertising agencies, distributors and retailers of *Bearcat* Scanners are also not eligible for rebates. Please be sure to send in the correct amount for your scanner. Pay the listed **CE** price in this ad. *Do not* deduct the rebate amount since your rebate will be sent directly to you from Electra. Orders received with insufficient payments will not be processed and will be returned.

Bearcat® 250

List price $429.95/**CE price $279.00/$25.00 rebate**
Your final cost is a low $254.00

50 Channels • Crystalless • Searches Stores • Recalls • Digital clock • AC/DC Priority Channel • 3-Band • Count Feature.

Frequency range 32-50, 146-174, 420-512 MHz.

The *Bearcat* 250 performs any scanning function you could possibly want. With push button ease you can program up to 50 channels for automatic monitoring. Push another button and search for new frequencies. There are no crystals to limit what you want to hear. A special search feature of the *Bearcat* 250 actually stores 64 frequencies and recalls them, one at a time, at your convenience.

Bearcat® 220

List price $449.95/**CE price $289.00/$25.00 rebate**
Your final cost is a low $264.00

Aircraft and public service monitor. *Frequency range 32-50, 118-136 AM, 144-174, 420-512 MHz.*

The *Bearcat* 220 is one scanner which can monitor all public service bands plus the exciting AM aircraft band channels. Up to twenty frequencies may be scanned at the same time.

Not only does this new scanner feature normal search operation, where frequency limits are set and the scanner searches between your programmed parameters, it also searches marine or aircraft frequencies by pressing a single button.

Bearcat® 210XL

List price $349.95/**CE price $229.00/$25.00 rebate**
Your final cost a low $204.00

18 Channels • 3 Bands • Crystalless • AC/DC

Frequency range: 32-50, 144-174, 421-512 MHz.

The *Bearcat* 210XL scanning radio is the second generation scanner that replaces the popular *Bearcat* 210 and 211. It has almost twice the scanning capacity of the *Bearcat* 210 with 18 channels plus dual scanning speeds and a bright green fluorescent display. Automatic search finds new frequencies. Features scan delay, single antenna, patented track tuning and more!

NEW! Bearcat® 160

List price $299.95/**CE price $189.00/$20.00 rebate**
Your final cost is a low $169.00

16 Channels • 3 Bands • AC only • Priority Dual Scan Speeds • Direct Channel Access

Frequency range: 32-50, 144-174, 440-512 MHz.

Would you believe...the *Bearcat* 160 is the least expensive *Bearcat* crystalless scanner.

This scanner presents a new dimension in scanning form and function. Look at the smooth keyboard. No buttons to punch. No knobs to turn. Instead, finger-tip pads provide control of *all* scanning operations, including On/Off, Volume and Squelch. Of course the *Bearcat* 160 incorporates other advanced *Bearcat* features such as Priority, Direct Channel Access, Dual Scan Speeds, Automatic Channel Lockout, Scan Delay and Auxiliary. All this performance in sleek, contemporary styling. And at a price so low, it astounds even us!

Bearcat® 5

List price $134.95/**CE price $94.00/$5.00 rebate**
Your final cost is a low $89.00

8 Crystal Channels • 3 Bands • AC only

Frequency range: 33-50, 146-174, 450-508 MHz.

The *Bearcat* 5 is a value-packed crystal scanner built for the scanning professional — at a price the first-time buyer can afford. Individual lockout switches.

Bearcat® Four-Six ThinScan™

List price $189.95/**CE price $124.00/$10.00 rebate**
Your final cost is a low $114.00

Frequency range: 33-47, 152-164, 450-508 MHz.

The incredible, *Bearcat* Four-Six Thin Scan™ is like having an information center in your pocket. This three band, 6 channel crystal controlled scanner has patented Track Tuning on UHF. Scan Delay and Channel Lockout. Measures 2¾ x 6¼ x 1." Includes rubber ducky antenna. Order crystals for each channel. Made in Japan.

TEST ANY SCANNER

Test any scanner purchased from **Communications Electronics™** for 31 days before you decide to keep it. If for any reason you are not completely satisfied, return it in original condition with all parts in 31 days, for a prompt refund (less shipping/handling charges and rebate credits).

Fanon Slimline 6-HLU

List price $169.95/**CE price $109.00**

Low cost 6-channel, 3-band scanner!

The *Fanon* Slimline 6-HLU gives you six channels of crystal controlled excitement. Unique Automatic Peak Tuning Circuit adjusts the receiver front end for maximum sensitivity across the entire UHF band. Individual channel lockout switches. Frequency range 30-50, 146-175 and 450-512 MHz. Size 2¾ x6¼ x 1." Includes rubber ducky antenna. Order crystal certificates for each channel. Made in Japan.

Fanon Slimline 6-HL

List price $149.95/**CE price $99.00**

6-Channel performance at 4-channel cost!

Frequency range: 30-50, 146-175 MHz.

If you *don't* need the UHF band, get this model and save money. Same high performance and features as the model HLU without the UHF band. Order crystal certificates for each channel. Made in Japan.

FANON SCANNER ACCESSORIES

SCMA-6 Mobile Adapter/Battery Charger.....$49.00
CHB-6 AC Adapter/Battery Charger $15.00
CAT-6 Carrying case for Fanon w/Belt Clip $15.00
AUC-3 Auto lighter adapter/Battery Charger.....$15.00

OTHER SCANNERS & ACCESSORIES

Regency®‡ M400 Scanner.....$259.00
Regency® M100 Scanner.....$199.00
Regency® R1040 Scanner.....$169.00
SP50 AC Adapter $9.00
SP51 Battery Charger.....$9.00
SP58 Carrying Case for *Bearcat* 4-6 ThinScan™ ...$12.00
FB-E Frequency Directory for Eastern U.S.A. $12.00
FB-W Frequency Directory for Western U.S.A. $12.00
FFD Federal Frequency Directory for U.S.A. $12.00
MK350 Mobile mounting kit for *Bearcat* 350 .....$12.00
B-4 1.2 V AAA Ni-Cad's for ThinScan™ and Fanon ...$9.00
A-135cc Crystal certificate.....$3.00

Add $3.00 shipping for all accessories ordered at the same time.

INCREASED PERFORMANCE ANTENNAS

If you want the utmost in performance from your scanner, it is essential that you use an external antenna. We have six base and mobile antennas specifically designed for receiving all bands. Order **#A60** is a magnet mount mobile antenna. Order **#A61** is a gutter clip mobile antenna. Order **#A62** is a trunk-lip mobile antenna. Order **#A63** is a ¾ inch hole mount. Order **#A64** is a ⅝ inch snap-in mount, and **#A70** is an all band base station antenna. All antennas are $35.00 and $3.00 for UPS shipping in the continental United States.

BUY WITH CONFIDENCE

To ***get the fastest delivery from CE*** of any scanner, send or phone your order directly to our Scanner Distribution Center.™ Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. Out of stock items will be placed on backorder automatically unless CE is instructed differently. Most products that we sell have a manufacturer's warranty. Free copies of warranties on these products are available prior to purchase by writing to CE. International orders are invited with a $20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

Mail orders to: **Communications Electronics,™** Box 1002, Ann Arbor, Michigan 48106 U.S.A. Add $7.00 per scanner or phone product for U.P.S. *ground* shipping and handling, or $14.00 for faster U.P.S. *air* shipping to some locations. If you have a Master Charge or Visa card, you may call anytime and place a credit card order. **Order toll free** in the U.S.A. Dial 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. **Dealer inquiries invited.** All order lines at **Communications Electronics™** are staffed 24 hours.

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‡*Regency* is a federally registered trademark of Regency Electronics Inc.

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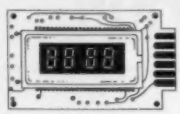
We're first with the best.℠

National Semiconductor Clock Modules



12VDC AUTOMOTIVE/ INSTRUMENT CLOCK

APPLICATIONS:
- In-dash autoclocks
- After-market auto/ RV clocks
- Aircraft-marine clks.
- 12VDC oper. instru.
- Portable/battery powered instruments.

Features: Bright 0.3" green display. Internal crystal time-base. ± 0.5 sec./day accur. Auto. display brightness control logic. Display color filterable to blue, blue-green, green & yellow. Complete – just add switches and lens.

MA1003 Module $16.95

MA1023 .7" Low Cost Digital LED Clock Module 8.95
MA1026 .7" Dig. LED Alarm Clock/Thermometer 16.95
MA5038 .3" Low Cost Digital LED Clock/Timer 6.95
MA1002 .5" LED Display Dig. Clock & Xformer 9.95

National Semiconductor RAM SALE

MM5290N-4 (MK4116/UPD416) . . **$4.95 each**
16K DYNAMIC RAM (250NS)
(8 EACH $39.95) (100 EACH $450.00/lot)

MM5290J-2 (MK4116/UPD416) . . **$6.95 each**
16K DYNAMIC RAM (150NS)
(8 EACH $49.95) (100 EACH $550.00/lot)

MM5298J-3A . . . . . $3.25 each
8K DYNAMIC RAM (LOW HALF OF MM5290J) 200NS
(8 EACH $23.95) (100 EACH $250.00/lot)

MM2114-3 . . . . . $5.95 each
4K STATIC RAM (300NS)
(8 EACH $43.95) (100 EACH $450.00/lot)

MM2114L-3 . . . . . $6.25 each
4K STATIC RAM (LOW POWER 300NS)
(8 EACH $44.95) (100 EACH $475.00/lot)

EPROM Erasing Lamp

- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact – only 7-5/8" x 2-7/8" x 2"
- Complete with holding tray for 4 chips.

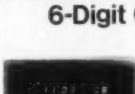
UVS-11E $79.95

Jumbo 6-Digit Clock Kit

- Four .630" ht. and two .300" ht. common anode displays
- Uses MM5314 clock chip
- Switches for hours, minutes and hold functions
- Hours easily viewable to 30 feet
- Simulated walnut case
- 115VAC operation
- 12 or 24 hour operation
- Includes all components, case and wall transformer
- Size: 6¾" x 3-1/8" x 1¾"

JE747 . . . . . $29.95

6-Digit Clock Kit



- Bright .300 ht. comm. cathode display
- Uses MM5314 clock chip
- Switches for hours, minutes and hold modes
- Hrs. easily viewable to 20 ft.
- Simulated walnut case
- 115 VAC operation
- 12 or 24 hr. operation
- Incl. all components, case & wall transformer
- Size: 6¾" x 3-1/8" x 1¾"

JE701 . . . . . $19.95

NEW! JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.

FEATURES:
- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC.
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- 120VAC input
- Size: 3-1/2" w x 5-1/16" L x 2" H

JE215 Adj. Dual Power Supply Kit (as shown) . . $24.95
(Picture not shown but similar in construction to above)
JE200 Reg. Power Supply Kit (5VDC, 1 amp) . . $14.95
JE205 Adapter Brd. (to JE200) ±5,±9 & ±12V. $12.95
JE210 Ver. Per. Sply. Kit, 5-15VDC, to 1.5amp. $19.95

MICROPROCESSOR COMPONENTS

8080A/8085A SUPPORT DEVICES

INS8080A	CPU	6.50
DP8212	8-Bit Input/Output	3.25
DP8214	Priority Interrupt Control	5.95
DP8216	Bi-Directional Bus Driver	3.49
DP8224	Clock Generator/Driver	3.95
DP8226	Bus Driver	3.49
DP8228	System Controller/Bus Driver	4.50
DP8238	System Controller	5.95
INS8060	I/O Expander for 48 Series	9.95
INS8250	Asynchronous Comm. Element	16.50
DP8251	Prog. Comm. I/O (USART)	7.95
DP8253	Prog. Interval Timer	14.95
DP8255	Prog. Peripheral I/O (PPI)	5.95
DP8257	Prog. DMA Control	15.95
DP8259	Prog. Interrupt Control	14.50
DP8275	Prog. CRT Controller	49.95
DP8279	Prog. Keyboard/Display Interface	15.95
DP8303	Octal Bus Receiver	6.95
DP8304	System Timing Element	6.95
DP8304	4-Bit Bi-Directional Receiver	3.95
DP8307	8-Bit Bi-Directional Receiver	5.95
DP8308	8-Bit Bi-Directional Receiver	3.95

6800/6800 SUPPORT DEVICES

MC6800	MPU	14.95
MC6802CP	MPU with Clock and RAM	19.95
MC6810AP1	128x8 Static RAM	4.95
MC6821	Peripheral Inter. Adapt (MC6800)	7.49
MC6828	Priority Interrupt Controller	16.95
MCM2016J-5	2048x8-Bit ROM (MCM6A36-4)	14.95
MC6850	Asynchronous Comm. Adapter	6.95
MC6852	Synchronous Serial Data Adapter	6.95
MC6860	600Bps Digital MODEM	19.95
MC6862	2400bps Modulator	12.95
MC6880A	Quad 3-State Bus Trans. (MC8T26)	2.50

MICROPROCESSOR CHIPS

Z80 (780C)	CPU (MK3880N) (5MHz)	13.95
Z80A (780-1)	CPU (MK3880N-4) (4MHz)	15.95
COP8PMC	CPU	19.95
2650	MPU	14.95
IDM2650ADC	CPU—8-Bit Slice (Com. Temp. Grade)	29.95
MC10800	MPU w/Clock (8BK Bytes Memory)	12.95
INS8900/N-4	MPU—8-Bit (8MHz)	15.95
INS8073N-4	CPU—Sgl. Chip 8-Bit (2Kbytes ROM)	19.95
INS8900/N-4	CPU (256 Bytes RAM)	24.95
INS8073N	CPU—64 Bytes RAM	24.95
INS8073N	CPU w/Basic Micro Interpreter	29.95
P8080	CPU	19.95
INS4000	CPU—16-Bit	29.95
TMS9995JL	MPU—16-Bit	49.95

SHIFT REGISTERS

MM5024H	Dual 32-Bit Dynamic	.99
MM5013H	Dual 50-Bit Dynamic	.99
MM5064H	Dual 100-Bit Static	.99
MM5184H	Dual 64-Bit Accumulator	.99
MM1402	256-Bit Dynamic	2.95
MM5013	1024-Bit Dynamic/Accumulator	1.95
MM5003H	1024/32-Bit Dynamic	.99
MM5024N	Octal 32-Bit	9.95
MM5025N	Octal 50-Bit	9.95
2504V (100KA)	1024-Bit Dynamic	3.95
2518N	Hex 32-Bit Static	4.95
2512V	Dual 132-Bit Static	2.95
2520V	512-Bit Dynamic	.99
2535V	1024-Bit Dynamic	2.95
2517V	Dual 256-Bit Static	2.95
2539V	Dual 200-Bit Static	4.99
2550V	Dual 240-Bit Static	4.99
2539N	Quad 80-Bit Static	3.95
2543PC	Fifo (Dual 64)	9.95

DATA ACQUISITION

AF100-1CN	Universal Active Filter 2.5%	5.95
AF121-1CJ	Touch Tone Low Pass Filter	19.95
AF122-1CJ	Touch Tone Low Pass Filter	25.95
LM324AH	Super Gain Op Amp	1.69
LM334Z	Constant Current Source	1.39
LM335Z	Temperature Transducer	1.49
LF356N	JFET Input Op Amp	1.15
LF398N	Sample & Hold Amplifiers	3.95
LM394H	Temp. Comp. Prec. Ref. (.3ppm/C°)	4.95
ADC0801LCN	8-Bit A/D Converter (1 LSB)	4.95
DAC0801LCN	8-Bit D/A Converter (0.3% Lin.)	2.25

DATA ACQUISITION (CONTINUED)

ADC0809CCN	8-Bit A/D Converter (8-Ch. Multi.)	5.25
ADC0811CCN	8-Bit A/D Converter (16-Ch. Multi.)	10.95
DAC1020LCN	10-Bit D/A Conv. Micro. Comp. (0.05%)	11.95
DAC1020MLCN	10-Bit D/A Conv. Micro. Comp. (0.20%)	6.95
DAC1021LCN	10-Bit D/A Converter (0.05% Lin.)	8.49
DAC1022LCN	10-Bit D/A Converter (0.2% Lin.)	5.95
DAC1222LCN	12-Bit D/A Converter (0.2% Lin.)	9.95
CD4051N	8-Channel Multiplexer	1.25
AY-5-3810	28K BAUD UART	9.95

RAM'S

1101	256x1 Static	1.49
1103	1024x1 Dynamic	.99
2101 (2102)	256x4 Static	3.95
2102	1024x1 Static	1.19
2111	256x4 Static	1.99
2111 (2112)	256x4 Static	3.95
2112	256x4 Static MOS	4.95
2114	1024x4 Static 450ns	5.95
2114L	1024x4 Static Low Power	6.95
2114-3	1024x4 Static 300ns	7.49
2114L-3	1024x4 Static 300ns Low Power	7.95
2117	16,384x1 Dynamic 350ns (house-marked)	4.95
4116 (UPD416)	16K Dynamic 250ns	4.95
MM5270J	4096x1 Fast 70ns	19.95
5101	256x4 Static	1.95
MM5203	1024x1 Dynamic Fully Decoded	.99
MM5262	2Kx1 Dynamic	.99
MM5290/2107	16K Dynamic 250ns	4.95
MM5290-2(4116)	16K Dynamic 150ns (UPD416)	6.95
MM5298J-3A	8K 250ns, 200ns (lower ½ of MM5290J)	4.95
7489	64x4 Static	1.79
UPD414/MK4027	4K Dynamic 55ns	4.95
TMS4045-45PCL	4K Static	14.95
TMS4045	4096x4 Static	14.95

PROMS/EPROMS

1702A	2K UV Erasable PROM	5.95
2708	8K EPROM	9.95
TMS2532	32K EPROM (-5V, +5V, +12V)	19.95
2716/Intel2816(T1)	16K EPROM (Single +5V)	17.95
2732/Intel2532(T1)	32K EPROM	49.95
2758	8K EPROM (450ns) (Single +5V)	7.95
5301	1024 PROM	14.95
82S23(74S188)	32x8 PROM (Open Collector)	4.95
82S115	4096 Bipolar PROM	19.95
82S123(74S288)	32x8 Tri-State Bipolar PROM	4.95
82S126	8K PROM	29.95

ROM'S

2513(2repl)	Character Generator (Upper Case)	9.95
2513(2repl)	Character Generator (Lower Case)	9.95
2316N	Character Generator	19.95
MM5230N	2048-Bit Read Only Memory	1.95

NMOS READ ONLY MEMORIES

MCM66730P	128x8x7 ASCII Shifted w/Greek	13.95
MCM66740P	128x5x7 Math Symbol & Pictures	13.95
MCM67750P	128x5x7 Alpha, Control Char. Gen.	13.95

MICROPROCESSOR MANUALS

M-280	User Manual	7.95
M-COP1560	User Manual	7.95
M-3880	User Manual	5.95

SPECIAL FUNCTION

DS8623CN	Dual MOS Clock Driver (8MHz)	3.95
DS8624CN	Dual MOS Clock Driver (8MHz)	1.95
INS1770N-1	Floppy Disc Controller	29.95
INS8060N	Communication Chip	19.95
MM5837N	Microprocessor Real Time Clock	6.95
MM5benN	Microprocessor Compatible Clock	13.95
COP402N	Microcontroller with 64-Digit RAM and Direct LED Drive	6.95
COP420N	Microcontroller with 64-Digit RAM & Direct LED Drive w/N Bus Int.	7.49
COP452N	32-Seg.VAC Fluor. Driver (28-pin pkg.)	3.95

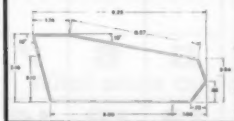
TELEPHONE/KEYBOARD CHIPS

AY-5-9100	Push Button Telephone Dialer	14.95
AY-5-9200	Repertory Dialer	24.95
AY-5-9900	CMOS Clock Generator	4.95
AY-5-2376	Keyboard Encoder (66 keys)	21.95
HD6600	Keyboard Encoder (53 keys)	7.95
74C922	Keyboard Encoder (16 keys)	5.49
MC923	Keyboard Encoder (20 keys)	5.75
MM5298N	Push Button Pulse Dialer	7.95
MM5740N	16/64-Key Serial Keyboard Encoder	9.95

DESIGNERS' SERIES
Blank Desk-Top Electronic Enclosures

- High strength epoxy molded end pieces in mocha brown finish.
- Sliding rear/bottom panel for service and component accessibility.
- Top/bottom panels .080 thk alum. Alodine type 1200 finish (gold tint color) for best paint adhesion after modification.
- Vented top and bottom panels for cooling efficiency.
- Rigid construction provides unlimited applications.

CONSTRUCTION:
The "DTE" Blank Desk Top Electronic Enclosures are designed to blend and complement today's modern computer equipment and can be used in both industrial and home. The end pieces are precision molded with an internal slot (all around) to accept both top and bottom panels. The panels are then fastened to ¼" thick tabs inside the end pieces to provide maximum rigidity to the enclosure. For ease of equipment servicing, the rear/bottom panel slides back on slotted tracks while the rest of the enclosure remains intact. Different panel widths may be used while maintaining a common profile outline. The molded end pieces can also be painted to match any panel color scheme.



Enclosure Model No.	Panel Width	PRICE
DTE-8	8.00"	$29.95
DTE-11	10.65"	$32.95
DTE-14	14.00"	$34.95

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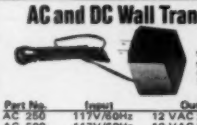

Ideal for use with clocks, games, power supplies or any other type of AC or DC application.

Part No.	Input	Output	Price
AC 250	117V/60Hz	12 VAC 250mA	$3.95
AC 500	117V/60Hz	12 VAC 500mA	$4.95
AC1000	117V/60Hz	12 VAC 1 amp	$5.95
AC1700	117V/60Hz	9 VAC 1.7 amp	$6.95
DV 9200	117V/60Hz	9 VDC 200mA	$3.25
DC 900	120V/60Hz	9 VDC 500mA	$3.95

CONNECTORS

DB25P	D-Subminiature Plug	$2.95
DB25S	D-Subminiature Socket	$3.50
DB51226	Cover for DB25P/S	$1.75
22/44SE	P.C. Edge (22/44 Pin)	$2.95
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UG99/U	BNC Jack	$3.79
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SO239	UHF Panel Recp.	$1.29
PL258	UHF Adapter	$1.60
PL259	UHF Plug	$1.60
UG260/U	BNC Plug	$1.79
UG1094/U	BNC Bulkhead Recp.	$1.29

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Expand your 4K TRS-80 System to 16K.
Kit comes complete with:
★ 8 ea. MM5290 (UPD416/4116) 16K Dyn. Rams (*NS)
★ Documentation for Conversion

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JE610 ASCII Encoded Keyboard Kit

The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and −12V @ 10 mA for operation. Features: 60 keys generate the 128 characters, upper and lower case ASCII set. Fully buffered. Two user-define keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector. Size: 3½"H x 14¾"W x 8¾"D

JE610/DTE-AK (as pictured above) . . . **$124.95**
JE610 Kit 62-Key Keyboard, PC Board, & Components (no case) . . . . **$ 79.95**
K62 62-Key Keyboard (Keyboard only) . . . **$ 34.95**
DTE-AK (case only – 3¾"Hx13"Wx8¾"D) **$ 49.95**

JE600 Hexadecimal Encoder Kit

FULL 8-BIT LATCHED OUTPUT
19-KEY KEYBOARD

The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3¾"H x 8¾"W x 8¾"D

JE600/DTE-HK (as pictured above) **$99.95**
JE600 Kit 19-Key Hexadec. Keyboard, PC Board & Cmpnts. (no case) . . **$59.95**
K19 19-Key Keyboard (Keyboard only) **$14.95**
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GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	14	7	7	7	7	7	7	14	14	14	21
ARGENTINA	21	14A	14	14	7	7	14	21	21A	21A	21A	21
AUSTRALIA	21A	14A	14	7	7B	7B	7B	14	14	14	21A	21A
CANAL ZONE	21	14	14	7	7	7	7A	14A	21	21A	21A	21A
ENGLAND	14	7	7	7	7	7A	14	21	21A	21	14	14
HAWAII	21A	14	14	7	7	7	7	14	14	21	21A	21A
INDIA	14	7A	7B	7B	7B	7B	14	14	14A	14A	14	14
JAPAN	21	7A	7B	7B	7B	7	7	7	14	14B	14	21
MEXICO	21	14	14	7	7	7	7	14	21	21A	21A	21
PHILIPPINES	21	7	7	7B	7B	7B	7B	7B	14B	14	14	14A
PUERTO RICO	21	14	7	7	7	7	14	14	21	21A	21A	21
SOUTH AFRICA	14	7A	7	7	7B	14	14A	21	21A	21A	21A	21
U. S. S. R.	7B	7	7	7	7	7B	14	14	21	21	14	7B
WEST COAST	21	14	14	7	7	7	7	14	21	21	21A	21A

CENTRAL UNITED STATES TO:

ALASKA	14A	14	14	7	7	7	7	7	14	14	14	21
ARGENTINA	21	14	14	7A	7	7	14	21	21A	21A	21A	21
AUSTRALIA	21A	21	14A	14	7B	7B	7B	14	14	14	21A	21A
CANAL ZONE	21	14	14	7	7	7	7A	14A	21	21A	21A	21A
ENGLAND	14	7	7	7	7	7	7A	14	14A	21A	14	14
HAWAII	21A	21	14	7	7	7	7	14	14	21	21A	21A
INDIA	14	14	7A	7B	7B	7B	7B	7B	14	14	14	14
JAPAN	21	14	14	7B	7B	7	7	7	14	14	14	21
MEXICO	21	14	7	7	7	7	7	14	14	21	21A	21A
PHILIPPINES	21	14	14	7B	7B	7B	7B	7B	14B	14	14	14A
PUERTO RICO	21	14A	14	7	7	7	14	14	21	21A	21A	21
SOUTH AFRICA	14	14	7B	7	7B	7B	14	14A	21	21A	21A	21
U. S. S. R.	7B	7	7	7	7	7B	7B	14	14	21	14	7B

WESTERN UNITED STATES TO:

ALASKA	14A	14	14	7	7	7	7	7	14	14	14	21
ARGENTINA	21A	21	14	14	7	7	14	21	21	21A	21A	21A
AUSTRALIA	21A	21A	21	14	14	14	14	14	14	14	21A	21A
CANAL ZONE	21	14A	14	7	7	7	7A	14	14	21	21A	21A
ENGLAND	14	7B	7	7	7	7	7	14	14	21A	14	14
HAWAII	21A	21A	14A	14	14	7	7	14	14A	21	21A	21A
INDIA	14	14	14	7B	7B	7B	7B	7B	14	14	14	14
JAPAN	21A	21	14	14	7B	7	7	7	14	14	14	21
MEXICO	21A	14	14	7	7	7	7	14	14	21	21A	21A
PHILIPPINES	21A	21	14A	14	7B	7B	7B	7B	14B	14	14	21
PUERTO RICO	21	14	7A	7	7	7	7	14	21	21A	21A	21A
SOUTH AFRICA	14	14	7	7	7B	7B	7B	14	14	21	21A	21
U. S. S. R.	7B	7B	7	7	7	7	7B	7B	14	14	14	7B
EAST COAST	21	14	14	7	7	7	7	14	21	21	21A	21A

A = Next higher frequency may also be useful
B = Difficult circuit this period
F = Fair G = Good P = Poor
SF = Chance of solar flares

april

sun	mon	tue	wed	thu	fri	sat
			1 G	2 F	3 G	4 G
5 G	6 G	7 F	8 G	9 G	10 F/SF	11 F
12 F	13 F	14 G	15 G	16 F	17 G	18 G
19 P/SF	20 F	21 G	22 G	23 G	24 G	25 G
26 G	27 F	28 F/SF	29 F	30 F		

THE FT-207R HANDIE CHECKLIST

- ☐ TA-2 telescopic whip antenna
- ☐ YM-24 speaker microphone
- ☐ LCC-7 leather case
- ☐ FSP-1 external speaker
- ☐ MMB-10 mobile mounting bracket
- ☐ FTS-32E CTCSS/burst encoder
- ☐ FTS-32ED CTCSS encoder/decoder
- ☐ NC-1A 15-hr. desk charger
- ☐ NC-3 4-hr. quick charger
- ☐ NC-9B wall charger
- ☐ PA-2 mobile battery eliminator/charger
- ☐ FBA-1 battery sleeve
- ☐ NBP-9 battery pack
- ☐ FEP-1 earphone

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